6 AUGUST 1958

GAS IN INDUSTRY

Supplement to the "GAS JOURNAL"

Vol. 1 No. 4

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GAS IN INDUSTRY

AUGUST 1958

Vol. I No. 4

FEATURES

ROLE OF GAS IN FOOD CAN PRODUCTION

BRITAIN'S LARGEST GALVANISING LINE

MANY INDUSTRIES USE GAS IN SYDNEY

THERMO MAGNETIC FLAME FAILURE DEVICE

DRYING PLASTER TILES
THE CONTINENTAL PRESS
GAS-HEATED INCUBATOR

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BISCUIT FACTORY CONSUMES 150 MILL. CU.FT. OF GAS A YEAR
INDUSTRIAL CONDITIONS IN THE U.S.A.
—By J. D. Harper

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Editorial

The Writing on the Wall

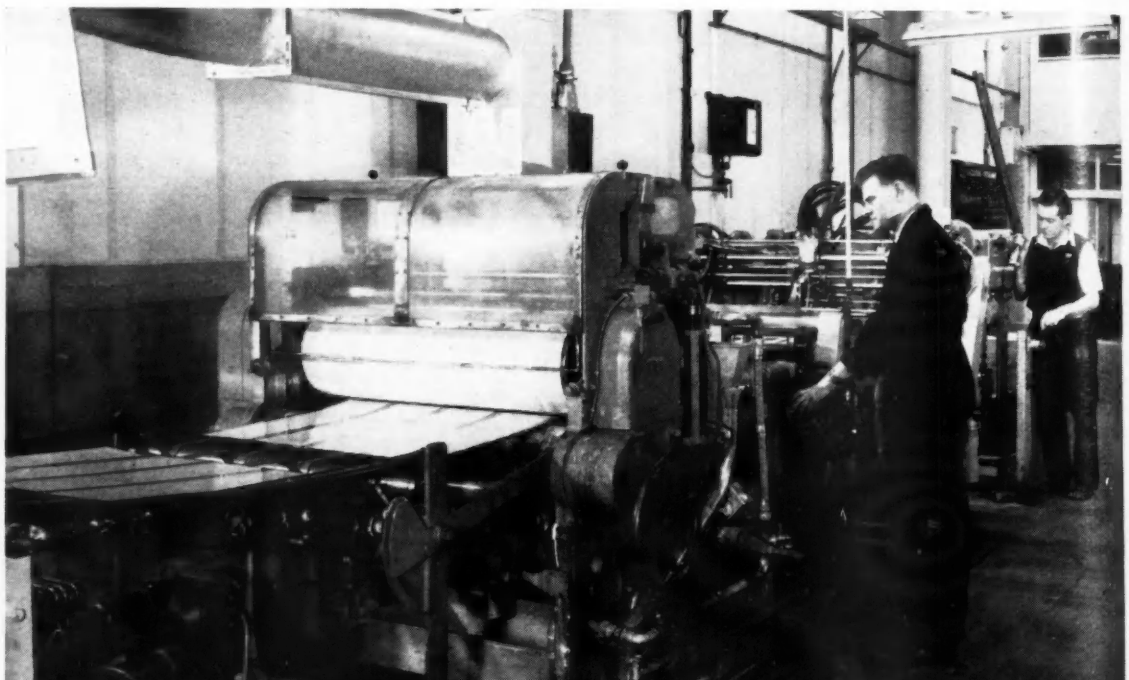
FIGURES for gas sales for the year ended March, 1958, were published last week. They reveal an increase of 5% in the sale of gas to industry and a virtual standstill in the sale of gas for commercial purposes. These results provide further evidence of the rapidly expanding use of gas for industrial purposes, and to our mind they suggest that the commercial load is not receiving all the attention it deserves.

The sale of gas for large-scale catering is extremely important and, in our view, could be made even more so. Competition from the electricity industry grows steadily more intense, mainly because considerable progress has been made in appliance development. The performance of these electric catering appliances still falls short of that shown by gas equipment but it is nevertheless a significant advance on pre-war or even immediately post-war standards. This improvement has enabled the manufacturers to ' shout the odds ' and they have done so in no uncertain fashion. As a result the electrical boys have made progress, particularly in call order equipment and in grills. That they still trail far behind gas in cornering the catering load should not make the gas industry relax its efforts. On the contrary, they should be redoubled and a far greater effort made to establish catering as a specialist branch of the industrial section (if not a section in its own right), rather than something in which an industrial gas engineer dabbles when occasion demands.

One of the means by which gas can retain and increase its catering load is by ensuring that this industry offers caterers and hoteliers a higher standard of know-how and technical understanding of their problems. Surely one of the reasons why restauranteurs and the like frequently call in manufacturers in order to discuss their requirements, and then merely employ the gas board in order to connect up the appliances selected, is because the customer does not consider the board's representatives to be sufficiently *au fait* with catering practice. One of the obvious solutions to this problem is education, and no form of education is more effective than associating with others facing similar difficulties. For this reason we suggest that some form of get-together for catering representatives, at both area and national levels, is long overdue. As we have suggested on previous occasions in the ' GAS JOURNAL,' the Hotel and Catering Exhibition should serve as the focal point of such activities, and a conference should be held in conjunction with the exhibition. Such a move would, we believe, greatly assist in building up the commercial load.

The other aspect of the year's results which we would like to emphasise is this—although a 5% increase in industrial gas sales appears satisfactory, it really means nothing unless it is related to the progress of industry generally. If, for example, the fortunes of light engineering dip by 8% and gas sales to this market fall by only 4%, we shall have done well; if, on the other hand, light engineering expand 8% and gas sales rise only 4%, we have nothing to be pleased about. Let us remember, therefore, that these figures mean very little unless they be assessed against the appropriate yardstick.

GAS PLAYS MANY VITAL ROLES IN MODERN FOOD CAN PRODUCTION



One of the lacquering lines from which tinplate sheets are passed to the 75 ft. ovens.

AMONG the various operations in the production of food cans (which the British housewife may well continue to call 'tins'), colour printing and varnishing the exterior designs, and lacquering the interior are both important. As tinplate is not absorbent, large-scale stoving plant is needed for drying and hardening the finishes.

There is also controlled stoving of the sealing compound used in the ends of the cans, and heat has to be applied for soldering the side seams. That is why the Metal Box Company's factory at Rochester, which makes cans, has been a leading customer of the South Eastern Gas Board since production started in 1957. It now uses more gas than any other single concern in that district of the Board's area.

The Metal Box organisation, as a whole, makes packages of all kinds, not only cans. but also plastic containers, frozen-food cartons and tin boxes of many sorts, on a world-wide basis, and it has reached a leading position in the industry.

The Rochester plant, one of the nine Metal Box factories in the U.K. which is entirely devoted to making cans, is a good example of specialisation applied to the manufacture of a single type of article, which, though not in itself very complicated, nonetheless does an exacting job.

Food preservation is playing an increasing part in modern life. Present-day canning methods are based on processes discovered in 1809, but it was not until 1922 that the modern type of can began to be generally accepted.

The Metal Box Company now makes hermetically sealable and individually tested cans at speeds in excess of 400 per minute. These cans are sent to the canner—who is usually the grower too—ready for filling and accompanied by separate can ends, which are fitted on by machines also supplied by the can manufacturer.

Thus, the making and the filling of cans take place at two separate establishments. It is uneconomic to transport them for long distances when empty, and so the can-maker sites his factory where possible near to a group of canneries.

The Rochester factory, then, serves the rich fields of Kent—the Garden of England—where seasonal crops such as peas are widely grown

Gas is used for all the industrial heating processes, and most of the domestic ones, including summer time hot-water and cooking. The factory is currently using some 1,884,500 cu.ft. weekly, or approximately 450,000 therms a year, and is responsible for one-third of the total increase in consumption in 1957 as compared with the previous year.

At present there is room for further

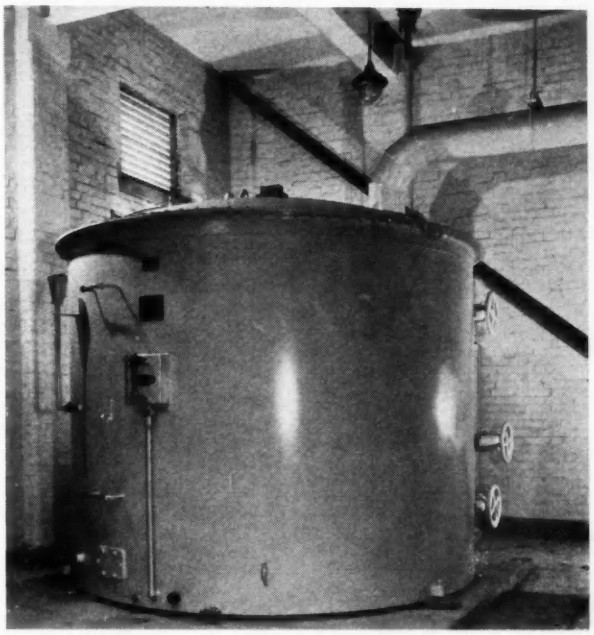
expansion and weekly consumption is expected to rise to 12,000 therms a week (600,000 a year), after three years. Calorific value of the supply is 500 B.t.u.

The Metal Box Company buys gas on an extension of the variable scale block tariff, which provides for graded discount according to the quantities used.

The factory layout is simple, with the main working area planned in strips, each doing a different job. The first is for printing, lacquering and consequent stoving. Tinplate storage follows, after which come the seven 'can-lines' with end presses and scroll-shears in the same strip. Warehouse and despatch sections follow. There are road and rail loading bays, the latter occupying the whole length of one side of the factory area and being linked to the Strood-Maidstone line.

Offices and canteen blocks make use of large areas of coloured, frosted glass; they are in modern style with much use of plain wood and contemporary fabrics. A covered bridge, with a small general shop at the approach to it, connects the canteen block to the main factory. It provides a pleasant transition from a working to a recreational atmosphere. A large diameter stack serving the fume extraction system dominates the site.

In outline, the can-making process —against which the use of gas must be seen—involves coating standard tinplate sheets with protective lacquer on the side that will form the interior. Then each sheet, which is to form the bodies of a number of cans, is printed with a repeat design and varnished. Both operations include stoving.

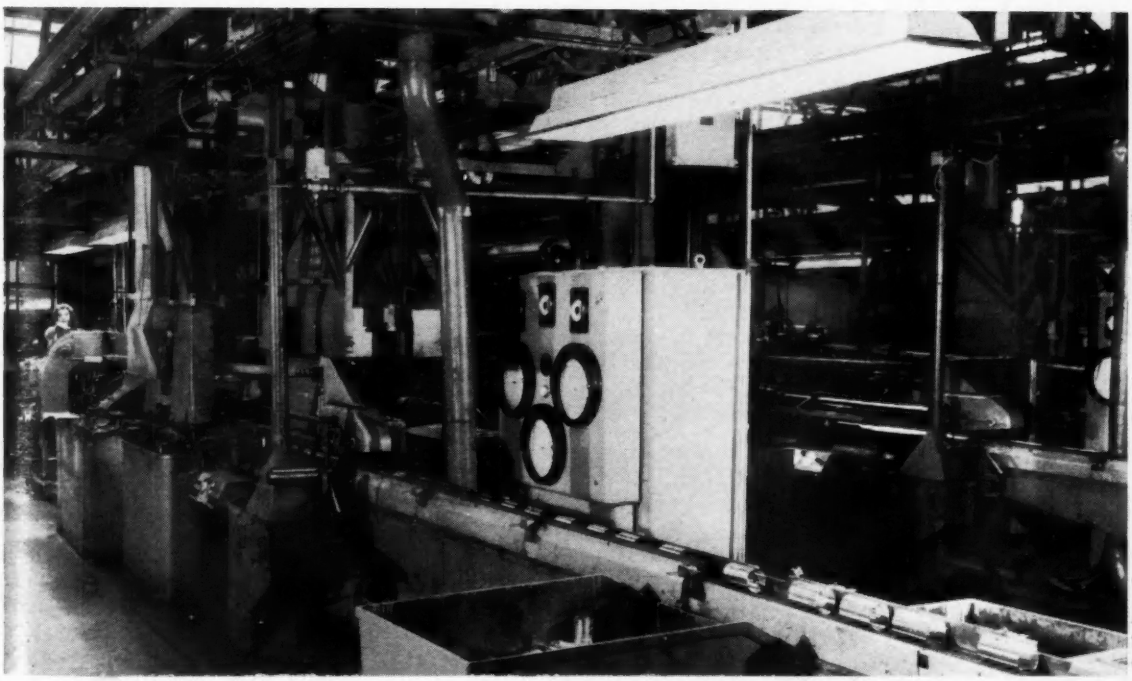


The main meter, of 60,000 cu.ft. capacity.

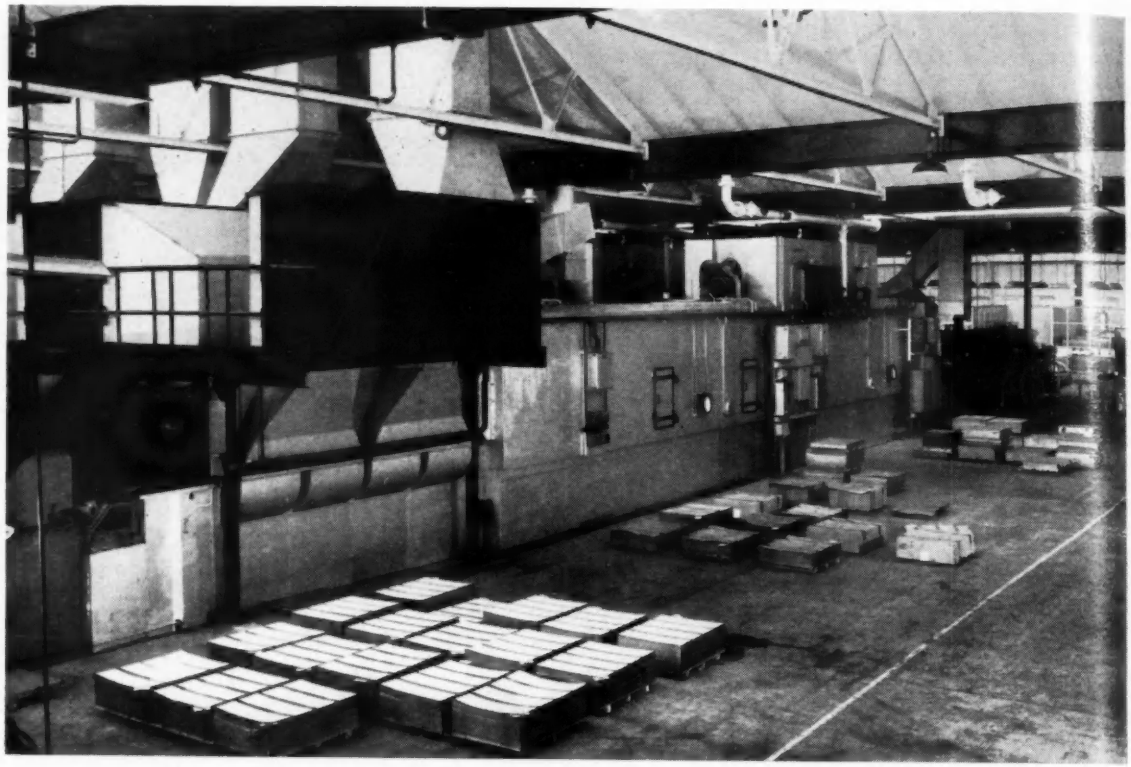
Sheets then pass to the can-line after slitting on a tandem slitter. Here, each body-blank is formed into an open-ended cylinder and the side seam is soldered. The ends of the cylinder are flanged to form part of the two end seams. Ends are separately made on a subsidiary production line for transport on pallets to the can-line proper.

End blanks are punched out of specially shaped sheets, and then stamped to shape before application of the liquid sealing compound which is stoved to harden it. With one end fitted on the can-line, the process is completed with a pressure-test.

Cans are conveyed on overhead runways for distribution either to further processing (in the case of beer cans) or to dispatch. All the plant,



One of the seven can-lines at Rochester. Sheets after printing are fed in (far left) and can bodies emerge for flanging.



Tinplate sheets are given two printing operations, before varnishing and stoving in one pass.

with the exception of the rotary printing machines, is of Metal Box design and is made at the company's machinery building factories.

A high proportion is either automatic or calls for only semi-skilled attendance. Starting up the whole factory, for instance, is the duty of one semi-skilled workman. Handling, where not automatic, is usually by means of palletised trucks.

About 80% of the gas used is for stoving and is supplied neat to the ovens. For soldering upon the can-lines a two-thirds mixture is supplied from separately housed mixers adjacent to the main meter-house which is apart from the principal factory area.

The nearly 2 mill. cu.ft. of gas consumed weekly during two eight-hour shifts a day requires special supply and safety arrangements. After passing into the Holmes BM 90 meter of 60,000 cu.ft. capacity, it passes via a Donkin non-return valve to the mixer house. Here three Selas mixers incorporating boosters are used to supply the can-line gas. One is kept as a stand-by.

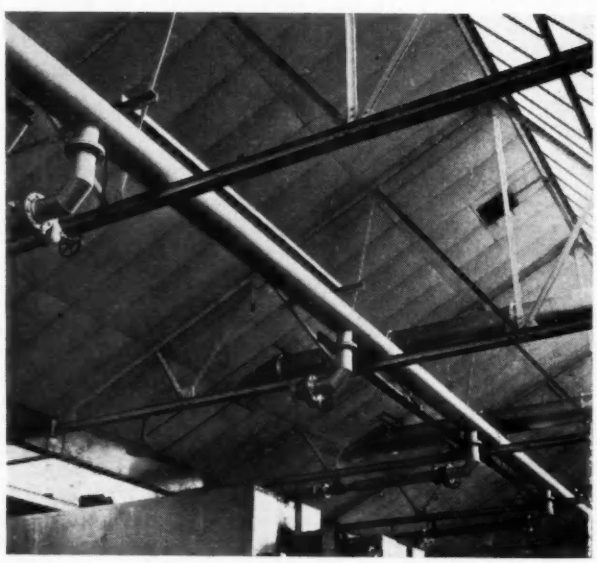
The main supply here divides into neat and mixed gas for separate transmission to the factory by underground pipe, which incorporates a water siphon with access from the factory roadway. The mixers give scale-reading of mixture as well as visual flame-check.

Boosting, which is necessary for the can-line supply of mixed gas, steps up the town pressure of 6 in.w.g. to about 55 in. Maintenance of mixers and associated plant requires two hours a week with one engineer in attendance.

Near the point of entry to the main factory, the mains are fitted with safety flanges for blow-out to atmosphere as a safety precaution, in addition to the non-return valves. All the main pipework, by United Kingdom Construction Ltd., is fabricated by welding.

The main ovens developed by the Company for continuous stoving of lacquered or printed sheets and for lacquering beer-can interiors are of similar basic design. They are claimed to be the most up-to-date of their type anywhere. Five are employed at Rochester; three for lacquering and two for printing. The lacquering ovens are 75 ft. long and those for printing 55 ft.

Gas consumptions are of the order



The Rochester plant is planned for future expansion of production. The neat-gas supply line is ready for further stoving equipment.

of 5,000 to 3,000 cu.ft. per hour, which is stepped-up to 12,000 cu.ft. and 3,000 cu.ft. respectively for lacquering and printing during the starting-up phase. Capacities are up to 6,000 tinplate sheets an hour, according to the stoving cycle required.

All these large ovens are of the forced convection type known as 'direct externally fired,' i.e., air direct from external combustion chambers is used for stoving. That this is possible where the air comes into contact with food cans in process of manufacture is a considerable testimony to the complete combustion achieved.

Design of the ovens ensures that sheets are raised rapidly to the required temperature and then maintained accurately at this temperature for a controlled period. Air that has imparted its heat to the components is recirculated to the combustion chamber from which it is drawn by fans for further delivery.

Gas governors on the ovens reduce the pressure to about 3 in. w.g. before the burner stage. Burners are luminous type with fishtail pattern flame and large turndown range.

'Fail Safe'

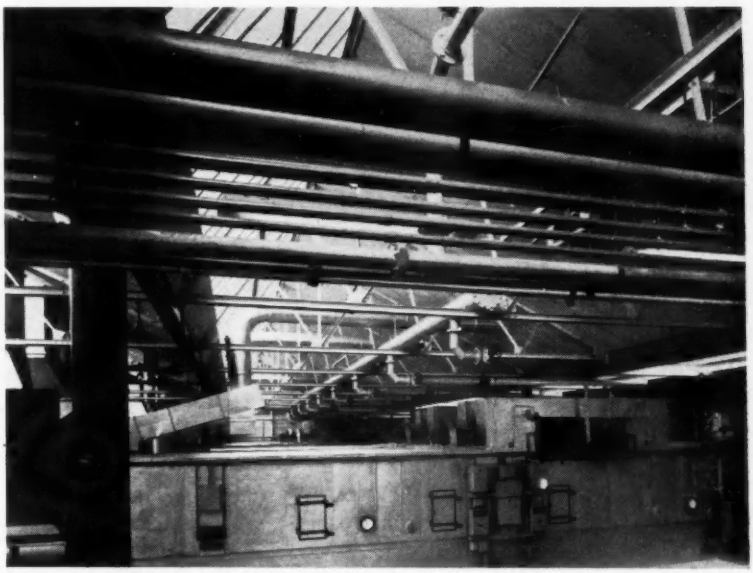
Burner control is similar for all the large ovens and is the result of much detailed attention. It provides automatic starting up sequence with complete 'fail safe' characteristics. Control button panels and instrumentation comprising Cambridge recorders and P.A.M. thermostats are combined in a single centrally-placed station on each oven.

The starting cycle is controlled by sequential relays. It affords a purging period, followed by a short ignition period, during which the flame is detected by a conductivity type device. The same device monitors the gas flame during running.

Protection is afforded against flame failure, electricity failure, circulating air failure and failure of magnetic valves to close when necessary. The conductivity probe circuit is automatically checked for faults which could simulate a flame during each starting cycle.

When operating temperatures are reached the conveyors are started manually. Any instance of faulty stoving would be recorded on the oven temperature charts from which the quality controller can check the treatment of any particular batch of tinplate.

A lacquering line of a different type is for beer cans which must withstand the action pressure of their contents and which, as befits their majestic task, are given special attention during manufacture. An additional interior lacquer coat is applied after the can body has been made from lacquered and printed tinplate, and this second lacquering is done on the finished-can side of the plant.



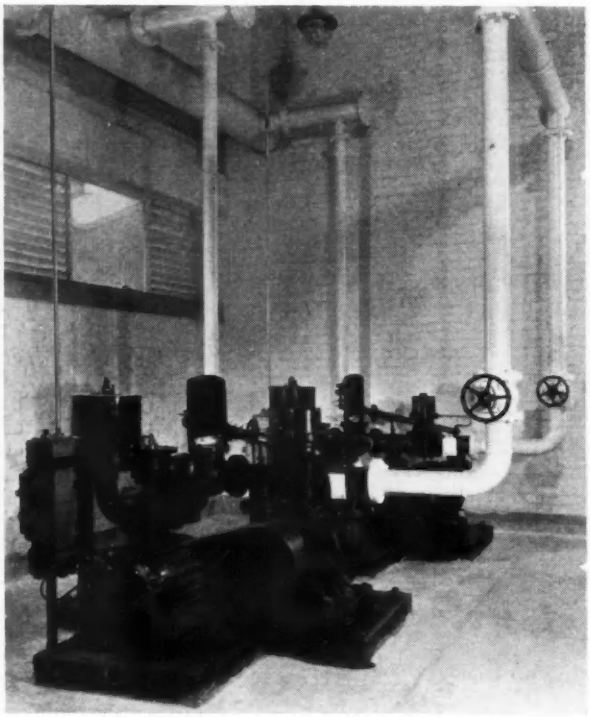
An impressive array of pipe-runs for gas, fume-extraction, and other services seen at oven-top level near the main line of ovens.

After passing on an overhead runway to the lacquering drum where they are sprayed while revolving, they pass on to the far end of the adjacent oven, as a partial pre-drying stage. Solvents that might cause running of the lacquer while stoving are thus removed.

Stoving temperature is in the region of 300°F. The outcoming cans are also scrutinised as an additional check. Not a little of the growing popularity of canned beer, which is now competing with the conventional product in public-houses, must be due to the attractive appearance of the distinctive printed designs on the cans.

Not all food cans have printed

Some indication of the architectural style of the Metal Box Company's Rochester factory may be gained from this view from the stairs in the office-block foyer.



Supply of gas to the separately - housed mixers and (larger pipes) delivery of 2:3 mixed gas for the can-lines.

designs on them; in many instances they are supplied blank so that the canner can use them with labels for a variety of branded products. Metal Box nevertheless specialise in the direct printed design.

The two printing lines at Rochester are said to be among the most modern in Europe. Two printing and one varnishing operation are done in sequence, the sheets passing directly from the varnisher to the oven, thus completing the process in one pass—a considerable advance on previous methods.

The blanks are then slit to size on a tandem slitter, and taken on pallets to the seven can-lines where all other operations follow to complete the open-top can. Production speed of this set of operations, which includes slitting and notching the edges of the body-blank so that the side seam can be formed, forming the blank into a cylinder, soldering the side-seam and flanging the ends, is the determining factor in the overall rate of production.

Speeds of between 400 and 600 cans a minute are now attained, the cans literally flashing down the can-line as fast as the eye can follow them. Certain operations, such as forming and soldering cannot, in fact, be followed by the eye at normal working speed.

Seven can-lines use a total of 4,200 cu.ft. of neat gas for maintaining solder temperatures, at a pressure boosted at the mixers to 55 in. w.g. or approx. 2 lb. per sq. in. Each can is in contact with the solder roller and wiper.

The bath is maintained at 600°F., and varies with the solder, by multiple jets governed by a Cambridge regulator. A check of this vital operation is carried out every 3 minutes and there is close control of the alloy ratio of the solder.

The final operation before the cans diverge either to despatch or—if beer cans—to the second lacquering stage, is testing under air pressure. The cans are fed into a revolving drum where a dummy end is connected to each. Automatic acceptance or rejection of the can depends on its ability to hold without leaks an air pressure of 5 lb. p.s.i. In addition, individual cans are taken for more rigorous testing. There is also considerable visual checking at various stages of manufacture.

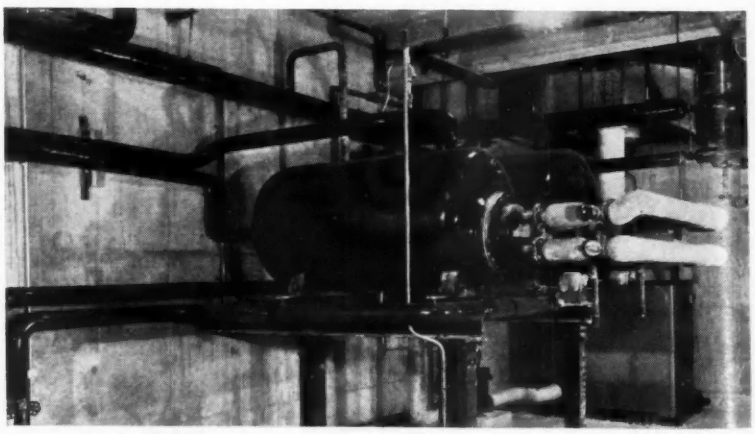
Compact, vertical air-blast ovens consuming 75 to 100 cu. ft. of gas per hour are used to dry the rubber-based sealing compound on the can-ends (into which the flanged cylinder is bedded to form a hermetic joint, not unlike the household fruit-bottler's rubber ring). This drying operation is done on the subsidiary production lines, as is the lacquering and forming of ends.

The problem of punching the discs for the ends with minimum waste (not unlike that of the cook when cutting scones from dough) is solved by scroll-shearing the tinplate sheets to give them a crenellated edge, and is achieved only as a result of careful calculation.

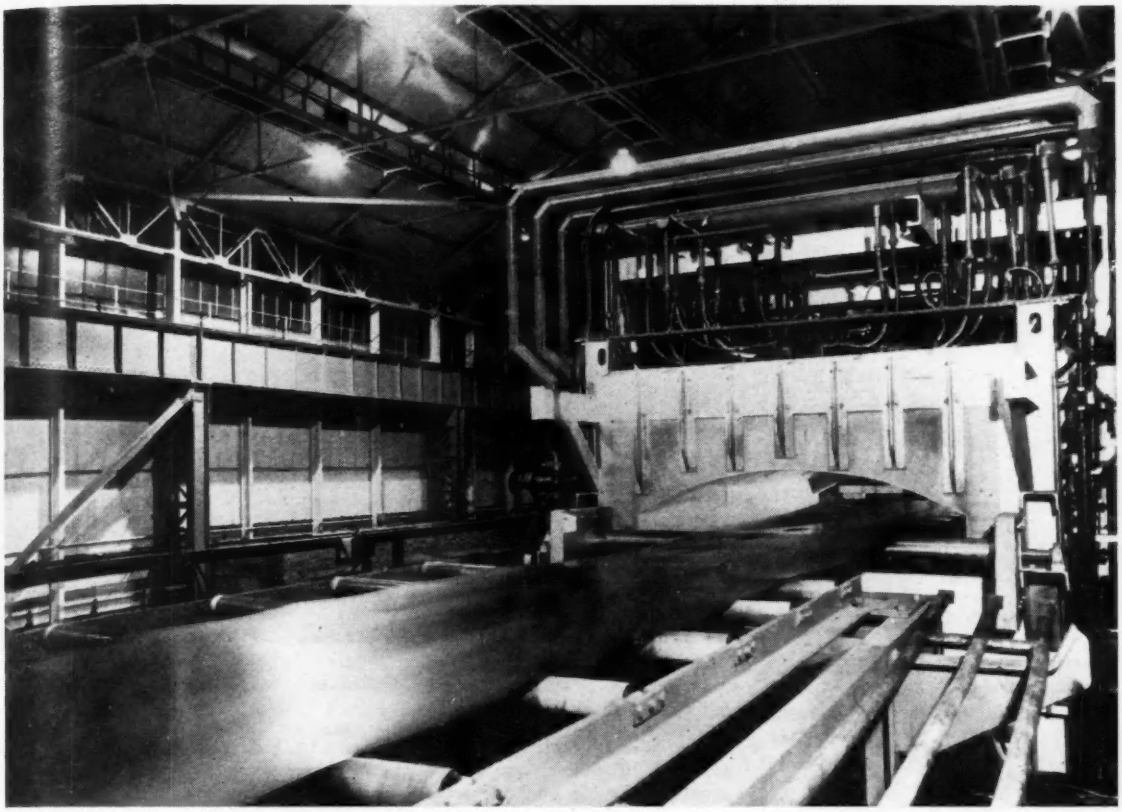
The two-shift working from 6.00 a.m. to 2.00 p.m. and 2.00 p.m. to 10.00 p.m. involves fairly intensive use of plant. Some aspects of maintenance are dealt with in the small but well-equipped tool room which contains a gas-fired heat treatment furnace.

Domestic hot water for canteen and washrooms comes from four separately housed calorifiers. Hot water for the primary system is supplied by large gas-fired Ideal boilers. The Plenum system for domestic heating uses steam as a primary medium from Danks oil-fired boilers.

When this is needed for short-term use for evening recreation or similar purposes in summer, it will later be fed from the Ideal boilers. There are two grades of canteen plus a senior staff dining-room in the modern canteen block, where gas cookers, hot-plates and hot-water urns for tea making are all gas-fired, using a total of about 1.5% of the factory's total gas requirements.



Calorifiers are used for domestic hot-water supply.



Picture shows the sheet entering the flame-heated cleaning furnace at the beginning of the run.

Britain's Largest Galvanising Line

DESIGNED to produce 10 tons of either galvanised sheet or coil per hour, the new galvanising line at the Ebbw Vale works of Richard Thomas & Baldwins, Ltd., is the largest and most modern plant of its kind.

The Head Wrightson Machine Co., Ltd., of Middlesbrough were the main contractors, subcontracting to Birlec Ltd., for the whole of the furnace equipment and atmosphere generators.

Continuous Operation

Nearly 700 ft. in length, 36 ft. wide, and 30 ft. high, the line takes strip up to 48 in. in width. Driven by roller conveyor at speeds of up to 250 ft. per minute through all the stages of cleaning, heat-treatment, pickling, coating, shearing to size, and inspecting, the strip is processed in one continuous operation. Apart from electrical and mechanical maintenance staff only six men per shift are required to control the equipment.

The strip is cleaned by passing through a gas-fired flame-heated furnace after which its temperature is further raised to 1,550°F. in the heating section of the reducing furnace by gas-fired radiant tubes. In the following section, which is electrically heated, the strip is maintained at a constant temperature where surface oxide is reduced, and annealing takes place. Entering a controlled cooling section it passes into the galvanising bath at 950-1,100°F., depending on the requirements of the bath, which is self-maintained at approximately 850°F. by the temperature of the strip passing through. Electric heating elements are provided for initial melting of the bath, and boosting during topping up.

Radical Departure

The strip emerges with a coating which has an adherence sufficient to withstand drawing and forming operations up to the limit of the steel base, and represents a radical departure from earlier methods.

Throughout the line, from entering the reducing furnace to emerging from the zinc bath, a protective atmosphere of dissociated ammonia is supplied to all chambers by the Birlec ammonia cracking plant.

Gas Consumption

The total electrical rating is approximately 1,000 kW plus 50 kW for each of the two ammonia dissociators. For the gas-fired sections, coke-oven gas with a gross calorific value of 500 B.t.u. per cu.ft. is used, the flame heater taking 18,000 cu.ft. per hour and the reducing furnace 21,000 cu.ft. per hour.

Honeywell Brown gas and temperature control equipment has been used throughout.

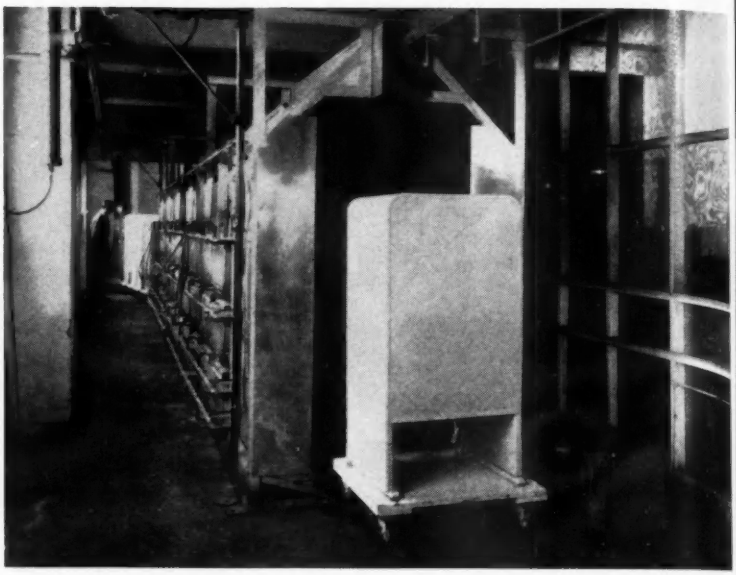
The new line is expected to be an important factor in meeting keen competition for the sale of galvanised sheet in world markets, and orders for the new products have been received from a number of overseas countries.

Many Industries Use Gas in Sydney

★

Industrial gas is booming in Australia. One of the most successful companies in this field is the Australian Gas Light Company, five of whose most recent installations are featured in this and the opposite page.

★



Radiant stoving installation.

THE pictures on this and the facing page are of gas-fired installations by the Australian Gas Light Company in Sydney.

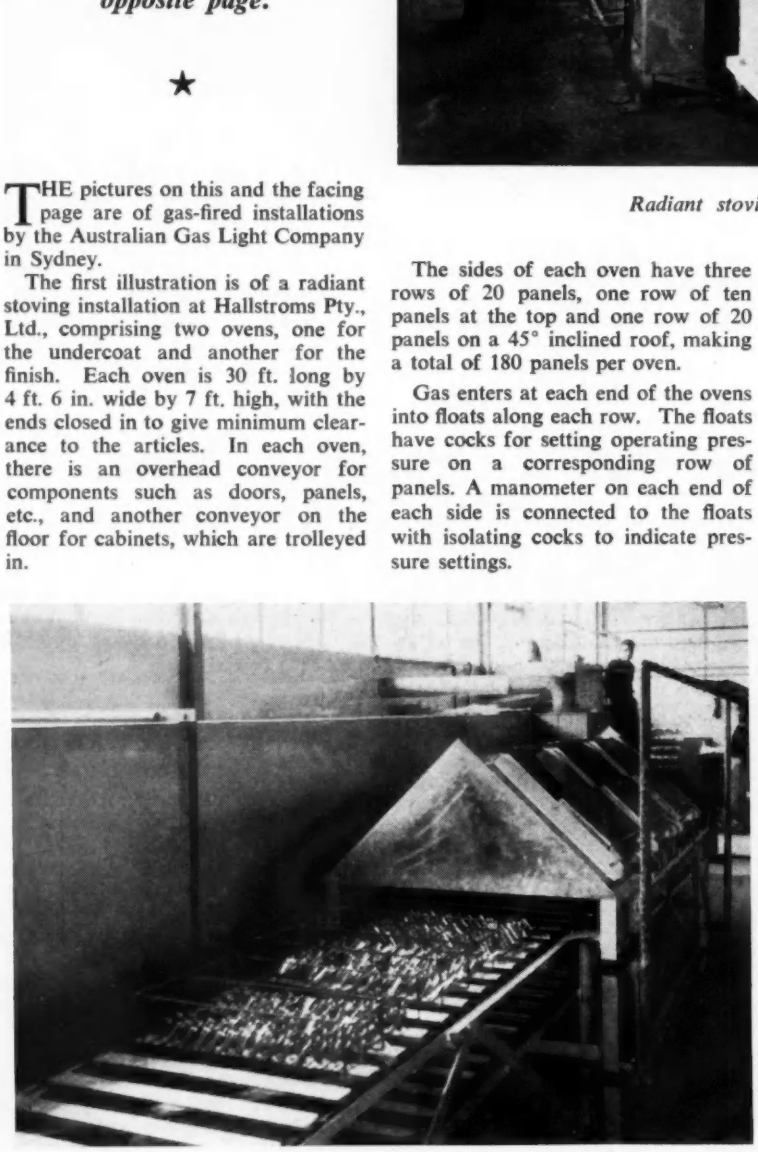
The first illustration is of a radiant stoving installation at Hallstroms Pty., Ltd., comprising two ovens, one for the undercoat and another for the finish. Each oven is 30 ft. long by 4 ft. 6 in. wide by 7 ft. high, with the ends closed in to give minimum clearance to the articles. In each oven, there is an overhead conveyor for components such as doors, panels, etc., and another conveyor on the floor for cabinets, which are trolleyed in.

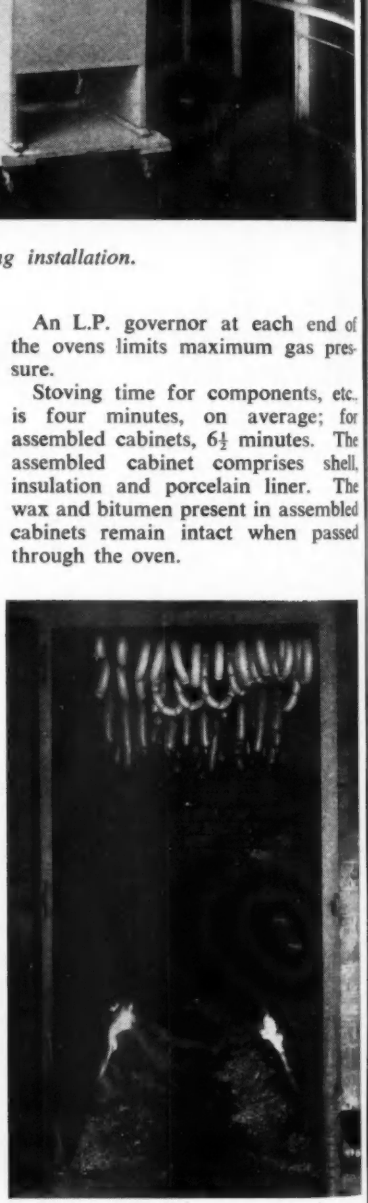
The sides of each oven have three rows of 20 panels, one row of ten panels at the top and one row of 20 panels on a 45° inclined roof, making a total of 180 panels per oven.

Gas enters at each end of the ovens into floats along each row. The floats have cocks for setting operating pressure on a corresponding row of panels. A manometer on each end of each side is connected to the floats with isolating cocks to indicate pressure settings.

An L.P. governor at each end of the ovens limits maximum gas pressure.

Stoving time for components, etc., is four minutes, on average; for assembled cabinets, 6½ minutes. The assembled cabinet comprises shell, insulation and porcelain liner. The wax and bitumen present in assembled cabinets remain intact when passed through the oven.





Left: *Infra-red oven used for drying enamelled lipstick tubes.* **Right:** *Smoking and curing delicatessen goods.*

Lipstick Tubes

The infra red oven used for drying enamelled lipstick tubes, shown in the picture below left is 2 ft. 6 in. wide by 1 ft. 3 in. high by 9 ft. long. It is fitted with six Gasco infra red panels radiating downwards on an inclined plane of 45°. The total maximum gas rate of the oven is approximately 180 cu.ft. per hour.

The lipstick tubes are held on special racks supplied by the client and are fed through the oven on a slat type conveyor fitted with a variable speed drive of 16-32 in. per minute. The overall length of the conveyor is 21 ft. Each slat is 24 in. long and spaced 4 in. apart. The lipstick tubes are coated with a clear enamel and require approximately a five-minute bake.

Curing Delicatassen

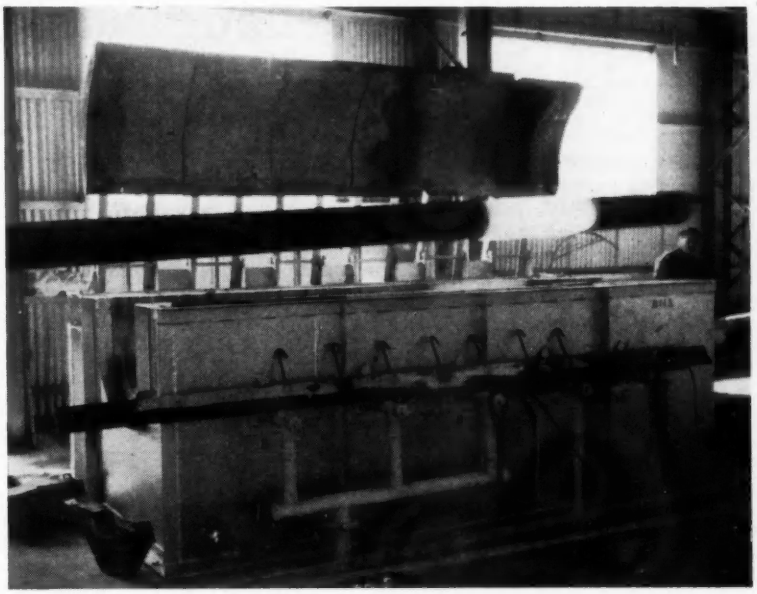
Below right is shown a gas-fired smoke room 6 ft. long by 4 ft. wide by 7 ft. high, used for smoking and curing small goods. The room is contained by a 4½ in. thick common brick wall and operates at 120°F.-160°F. The room is heated by two standard cast iron tube burners firing horizontally, one each side of the room. These burners are totally enclosed by a rectangular secondary air duct except for the opening through which the burner fires. This opening is situated in the inside vertical surface of the duct, thus leaving the top of the duct available for drying wet sawdust prior to burning it. The maximum gas rate for the room is 360 cu.ft. per hour.

Pipe Bending

The first picture on the second page shows pipe bending furnaces at Babcock & Wilcox Aust. Pty. Ltd. The furnaces are 12 ft. long and have a maximum gas rate of 5,500 cu.ft. per hour each. Pipes up to 15 in. diameter and 1½ in. thick can be heated uniformly ready for bending in approximately two hours.

Five premix-type gas burners fire from each side of the furnace under the pipe onto a refractory ramp so giving the products of combustion a circulatory motion around the section to be heated. The pipes sit in refractory cradles located at each end of the section to be heated and these cradles accurately limit the heating zone.

The gas burners are grouped so that any combination can be used to heat any desired length of pipe. All controls are mounted on a panel located about 6 ft. away from the side of the furnace. The mixing equipment is located under the floor level in channels linking the panel with the furnace.

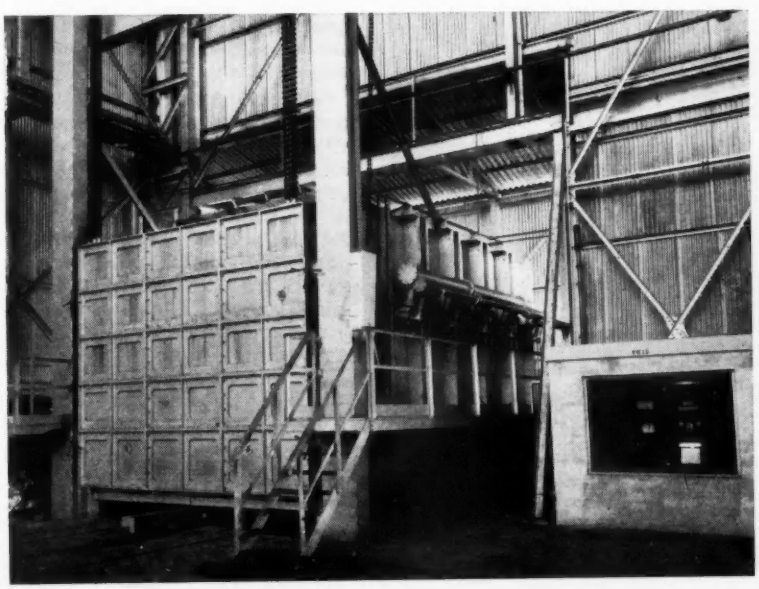


Pipe bending furnaces at Babcock & Wilcox Aust. Pty., Ltd.

Plate Heating

The plate heating furnace illustrated in the last photograph is a Dowson & Mason truck loaded furnace with working dimensions 14 ft. wide by 20 ft. long by 10 ft. high, and is capable of working at temperatures up to 1,100°C. Semi-nozzle mixing type burners, having a total maximum gas rate of approximately 16,000 cu.ft. per hour fire along the arch and down near hearth level. A hand-operated vertical lift door is located at one end of the furnace only.

The bogie truck has a flat refractory top and is moved in and out of the furnace by means of an electrically-operated winch. It takes about six hours to raise the furnace, plus a 20-ton load, to 1,100°C.



This furnace is one of the biggest imported to Australia since the war. It is used for heating such things as boiler shells and steel tanks.

Thermo Magnetic Flame Failure Valve

A SIMPLE MEANS OF PROVIDING PROTECTION

THE 'Spersom' G.809 thermo-magnetic valve—a simple means of providing for flame failure protection to multi-burner installations—is the subject of a new Gas Council Industrial Development Committee report based on information supplied by the West Midlands Gas Board Industrial Department.

The Spersom has three main functions: (1) It ensures a correct lighting procedure; (2) it will shut off the gas supply to the burner should the pilot become extinguished; (3) it will provide a constantly burning pilot for igniting the main burner. It is apparent from statistics published by the Ministry of Labour and National Service, that protection during the period of lighting up is most important.

Instructions Issued

Adequate instructions are issued by the makers concerning the location of the thermocouple and pilot burners, selection of burner tips, and method of fitting. A variety of burner tips are available.

The valve is manufactured by Sperryn & Co., Ltd., Moorsom Street, Birmingham, 6, and the valve tested was of ½ in. B.S.P. size.

A sectional arrangement of the valve, burner head and thermocouple is shown in Fig. I. The valve body, of cast aluminium, houses the valve system and incorporates the magnet and armature with the pilot burner connection and push button housing attached to the lower end of the body. The arrangement of the magnet, armature and main gas valves is also shown in Fig. 1.

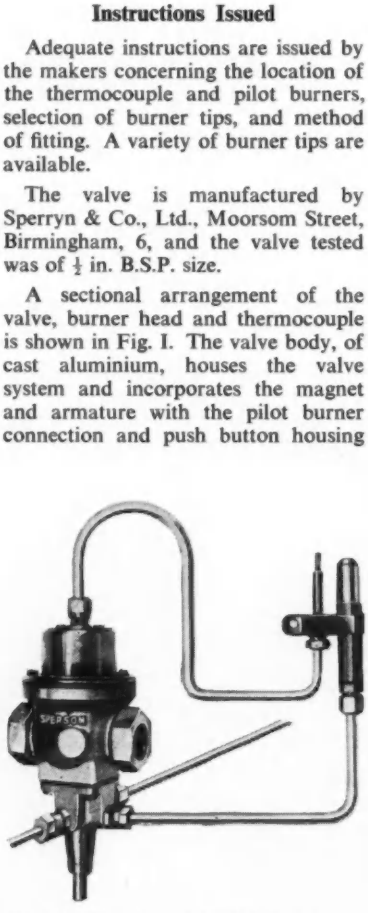


Fig. 2. The three ⅛ in. B.S.P. gas connections to the pilot burner—inlet, straight through connection for second device, and outlet to burner.

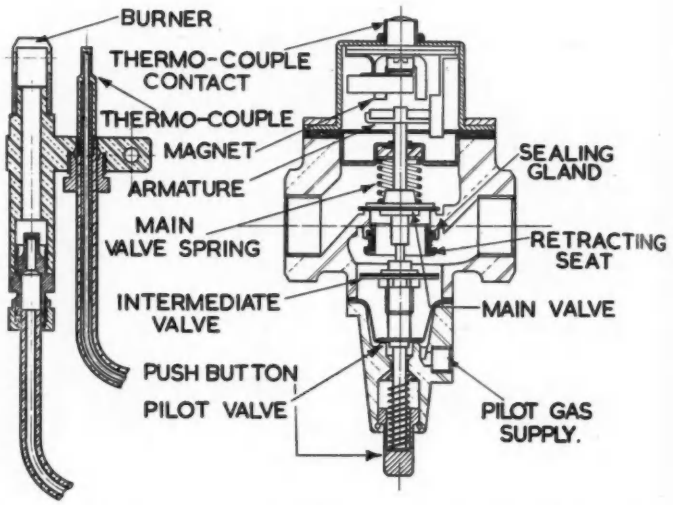


Fig. 1. Sectional arrangement of the valve, burner head and thermocouple.

The three ⅛ in. B.S.P. gas connections to the pilot burner system are clearly indicated in Fig. 2 and comprise an inlet, taken from upstream of all control apparatus, a straight through outlet for connecting other such devices in series, and a second outlet, at right angles to the inlet, supplying the pilot burner for the particular device, when the pilot valve is open.

Operation of the G.809 is generally similar to that of other thermo magnetic devices. When the push button is pressed the pilot valve in the lower housing is opened allowing gas to flow to the pilot burner. Simultaneously the seat is axially displaced, by the seat operating disc, (the latter being rigidly fixed to the push button spindle), while the main valve is kept sealed against the upper side of the seat and the armature is brought into contact with the magnet.

In this position the main burner is sealed from the gas supply by the main valve and the sealing glands between the body and the retracting seat. When the thermocouple tip is heated by the pilot flame and the push button released, the armature is retained by the magnet against the compression of the main valve spring and the retractable seat returns to its normal position. The pilot valve, which is free to move on the push button assembly is held open against the compression of the push button spring. The main valve is then open and allows gas to pass to the burner. On pilot flame extinction, with consequent loss of E.M.F., all valves return to the closed position under the action of their springs.

New Launderette for Smaller Town

FOLLOWING the successful development of over one thousand Bendix self-service launderettes in the United Kingdom, the field is now being extended by the introduction of the Bendix eight-washer launderette designed specifically to suit the smaller town with a population of 15,000-18,000. Until now the minimum size launderette has been the 12 washer unit and this has not been considered a practical proposition for towns with less than 18,000 to 20,000 population. With the introduction of the eight washer unit, with a low capital cost of £2,500-£3,000, the launderette service will be made available to people in the smaller towns.

The plant and equipment for this smaller launderette is substantially the same as that now used for the larger towns but one boiler only is required —the De La Rue Potterton boiler with one hot water storage cylinder of new design.

Drying Room Installation for Plaster Tiles and Ventilators

NORTH THAMES SOLVE A PROBLEM

VENTILATORS and acoustic tiles are manufactured from specially hardened plaster. These are cast into shape from rubber moulds in a very wet condition.

Difficulty, due to slowness of natural drying, was being experienced in meeting the demands for hospitals, halls and office construction in the area of the North Thames Gas Board.

The main product, a ceiling tile, measuring 24 in. by 24 in. by ⅜ in., contains when cast approximately 6 lb. of water which has to be evaporated. Very fast drying, however, would be detrimental and it was felt that this could be overcome by applying forced air convection in a drying room. A new building under construction in Essex was selected for this purpose, the main drying room measuring 40 ft. long by 30 ft. wide. At a height of 8 ft. a false ceiling was constructed of Asbestolux sheeting with a 1 in. Rocksil quilt; a good insulated ceiling was thus obtained.

Variable Speed Motor

Two views of this drying room are shown in Fig. 1 and 2, in which will be seen the warm air inlet trunking at high level and on the opposite side of the room at floor level, the outlet trunking discharging the air either outside the building, or returning some to the heater for recirculation. At the end of this trunking is an 18-in. diameter extractor fan with a variable speed motor.

A small room adjoining the drying room was selected for fitting the gas fired air heater and fan. This compact unit is shown in Fig. 3. It shows the inlet air duct from outside the building, with the warm air trunking from the fan passing into the drying room.

The quantities of air for recirculation can be varied by the operation of dampers.

Economy in the use of fuel and control of drying can be achieved by the manipulation of these dampers throughout the drying period, which is calculated to take 48 hours.

Air Changes

The drying room will hold 1,000 tiles, which are dried at a maximum temperature of 90°F. The plant will create 20 air changes per hour during the first 24 hours of the drying period, this rate being reduced on the second day as drying progresses. The inlet trunking is constructed of galvanised sheet steel, measuring 19½ in. by 18½ in., the warm air discharging through six 12 in. by 9 in. louvred outlets. The return air trunking is graduated in size and is fitted with four 18 in. by 12 in. louvred inlets. Each opening has adjustable air shutters for variable control.

The heating unit has a 21-in. diameter fan driven by a motor wound for 400 volts 3 phase electric supply. Between the fan and the heater is a gauze filter. The gas air heater is direct heated having a burner fitted with all metal luminous jets. The maximum output is 180,000 B.t.u. per hour.

Against Fan Failure

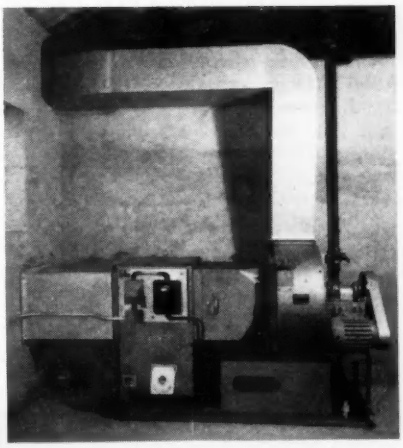
The gas pressure is controlled by a standard governor, while a magnetic gas valve, wired in series with the motor, provides against fan failure. Combustion safeguard equipment consists of a thermo electric device. Temperature control is by an adjustable rod type thermostat in the outlet trunking connected to a relay valve on the gas supply.

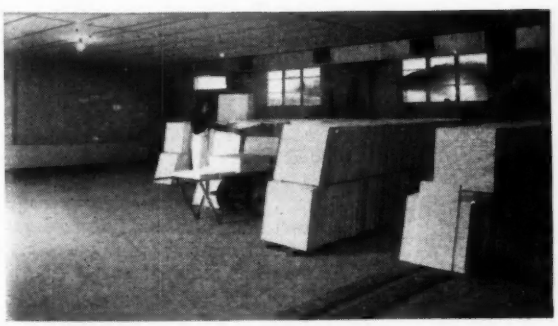
This installation was designed by the North Thames Gas Board.

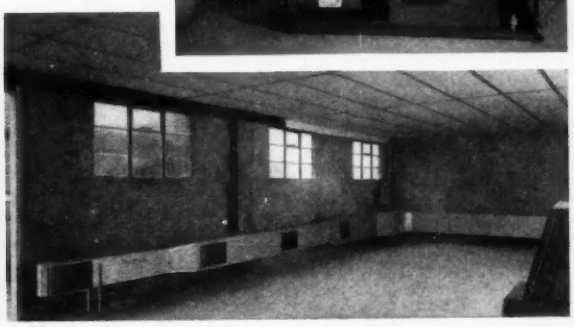
The air heating unit and trunking was manufactured and installed by Harris Engineering Co., Ltd.

Insulating ceiling material (manufactured by Cape Asbestos Co., Ltd.) was supplied and fixed by Harrison (Builders Merchants), Ltd.

This installation is in the factory of Dextroplast, Ltd., Abridge, Essex.







Figs. 1 and 2 (*Below, left and right*): *The warm air inlet trunking at high level and on the opposite side of the room at floor level, the outlet trunking discharging the air either outside the building, or returning some to the heater for recirculation.* **Fig. 3** (*opposite*): *The gas fired air heater and fan. Picture shows the inlet air duct from outside the building, with the warm air trunking from the fan passing into the drying room.*

THE CONTINENTAL PRESS

Drying of Enamel by Infra-red Gas Heating

TESTS were carried out with high-temperature infra-red heaters of the Schwank type to investigate the drying effect on the following goods: A pail with relatively small base area and high slightly tapering walls, a rectangular insert likewise with small bottom area relative to the height of the walls, a round basin with a large bottom and walls of small height, and, finally, a rectangular wash-basin likewise having a large base area and low walls.

Gas consumption was approximately 4.6 cu. m. per hour corresponding to an energy supply of 18,400 kcal per hour. The enamel slip used in the experiments contained on the average 35.8% water.

There were two sets of tests carried out, first with the vessels standing—with the radiator directed into the opening of the vessel directly against its inside bottom surface, and secondly, lying with the side walls facing the radiation and the opening at right angles to the radiation. The items were also tested singly and in groups.

The main purpose of the tests was, however, to investigate the effect of distance between the radiant source and the items being dried. It was found that there is practically a linear relationship between the distance of the surface from the radiant source and the drying time, the temperature rise of the item and the evaporating capacity.

By decreasing the separation by approximately half, the drying time is likewise halved. Items having large areas dry the quickest when the radiation strikes them at right-angles. Of greater importance for rapid drying is for the water vapour to be able to escape unhindered.

In this respect, the tests showed that the drying process is best begun from the bottom so that the convective currents produce extra drying. It was also noted in the tests that the enamel dried in this manner is much more resistant to scratching than the more 'mildly' dried normal product; it could be handled quite roughly without any traces of the enamel being left on the hands.

B. Naendorf. Gaswärme, Vol. 6. No. 12, December, 1957, p. 386.

	Länge	Breite	Höhe	Gewicht
	mm			g
Eimer	200/243		395	1190
Einsatz	340	180	370	2084
Rundschüssel	340		145	1030
Waschschüssel	300	300	100	945

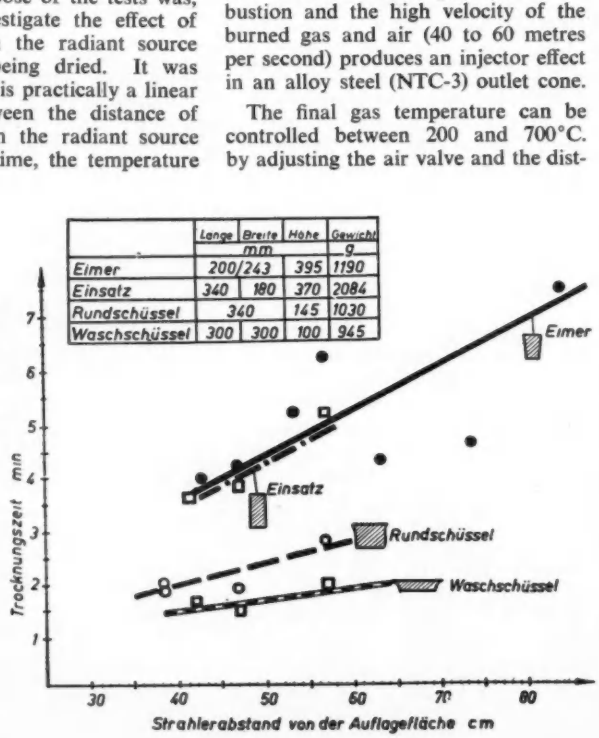


Figure illustrates the relationship of the drying time of different enamelled objects to the distance from the radiant heat source. Trocknungszeit, *drying time, minutes;* Strahlerabstand von der Auflagefläche, *distance of radiant source from surface;* Eimer, *pail;* Einsatz, *insert;* Rundschüssel, *round basin;* Waschschüssel, *washbasin;* Länge, *length;* Breite, *width;* Höhe, *depth;* Gewicht, *weight.*

Mould Drier with Open Type Combustion Chamber

A NEW type of portable mould-drying unit has been developed. It has an open type of combustion chamber which is more foolproof and simpler to operate, and is easier to maintain than the earlier types with enclosed combustion chambers.

The heating unit is a 'three-chamber' ring burner in which air, injected at a central nozzle, promotes combustion and the high velocity of the burned gas and air (40 to 60 metres per second) produces an injector effect in an alloy steel (NTC-3) outlet cone.

The final gas temperature can be controlled between 200 and 700°C. by adjusting the air valve and the distance of the outlet cone from the burner. No safeguard is required against failure of air supply since the gas is not then injected into the mould but burns lazily around the combustion chamber. Only a central gas safety shut-off valve is required.

The unit is made in four sizes, the smallest with an output of 8 cu. m. of hot gas per hour being for small moulds, the other sizes having outputs of 15, 30, and 50 cu. m. per hour. These mould driers are developed specially for their task on the principle that wind dries better than heat and wind is cheaper.

Drying is begun with full air supply and a small amount of gas, the gas being increased as the drying proceeds. With deep moulds, a simple plate duct may be inserted to direct the gases to the bottom of the mould.

Portability an Advantage

A great advantage of these units is their portability. When three units of the third size were used on a loam mould of 5 by 2.2 by 2.2 metres, with a surface area of 60 sq. m., the temperature inside the mould was first quickly brought to 240°C. and then increased slowly to 360°C. over some 16 hours.

After being kept at this temperature for a further 12 hours the units were shut down and the mould cooled to some 150°C. before being opened up. It was found to be fully dried out and free from cracks so that no blackleading was required.

Rickley, Gaswärme, Vol. 7, No. 4, April, 1958, p. 145.

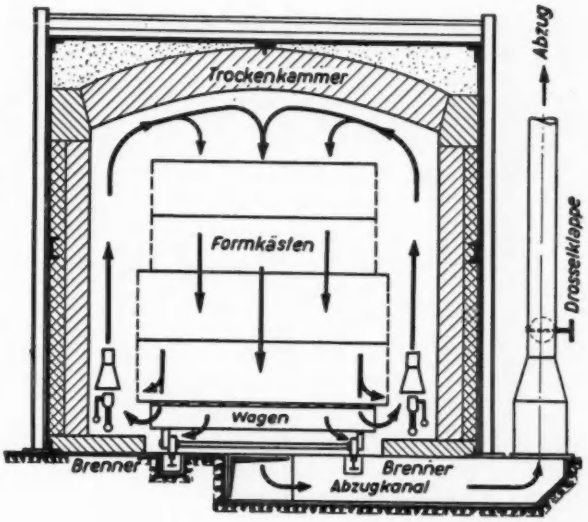
The Heating of Drying Chambers

THE diagram shows a method of using 'three chamber' injector ring burners to provide circulation in a drying chamber. The burners are mounted along the long wall of the chamber and the flame jet displaces the hot gases under the roof so that they pass downwards through the wares.

The injector effect of the burners, which is produced by the 40 to 60 m. per second air jet inside the burner rings, draws the gases from the bottom of the wares and recirculates them through the burner to the top of the drying chamber.

The whole chamber is maintained under a small positive pressure by control of the exhaust damper, so that no in-leakage of cold air occurs and incidentally only the colder gases escape.

Rickley, Gaswärme, Vol. 7, No. 4, April, 1958, p. 146.



Gas heated drying chamber with hot air circulation. Trockenkammer, *drying chamber;* Formkästen, *wares;* Wagen, *trolley;* Brenner, *burner;* Abzugkanal, *exhaust duct;* Abzug, *exhaust* Drosselklappe, *damper.*

HOT TESTING OF SHAFTS

IT is normal practice to test large turbine shafts for temperature stability before final machining, by slowly heating them in a furnace and rotating them at the same time.

The heating and cooling has to be closely controlled and probably maintained over 8 to 24 hours, to within 10° to 20°C. The maximum temperature required may be 400° to 500°C.

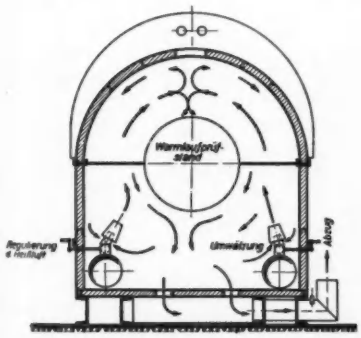
For the test to be successful it is essential that the temperature is uniform at all points, so that the shaft is heated uniformly. The injector effect used in the 'three-chamber' ring burner is particularly well suited to provide this uniform temperature.

A design which has been developed to this end and which is shown on the diagram, is to enclose the shaft in a series of hoods and to supply hot gas (a mixture of burned gas and excess air) to a series of injectors inside the hoods.

The hot gas is produced externally at a pressure of 300 to 500 mm. w.g. and both gas generator and injectors are temperature monitored and steplessly controllable. Five injectors are provided for each metre of length and provide an intensive circulation.

Temperature curves taken at various points inside the furnace are found to be identical, thus showing the effectiveness of the system.

Rickley, Gaswärme, Vol. 7, No. 4, April, 1958, p. 147.



Warmlaufprüfstand, *shaft being tested;* Regulierung d. Heissluft, *hot-air control;* Umwälzung, *recirculation;* Abzug, *exhaust.*

FEEDER HEATING IN GLASS BATHS

IN order to feed several glass machines from a central bath a series of enclosed channels or 'feeders' is needed. The bath itself is at a higher temperature than that required in the machines, but according to the throughput, some feeders will require heating to counteract losses in the feeder.

The 'three-chamber' pot burner has proved particularly successful for the purpose due to its high efficiency over a wide load range and its ability to operate under pressure. The heat supplied must be varied over the length of the feeder and to assist control the burners are grouped.

The gas supply to each group is automatically controlled and likewise the air/gas mixture is maintained at the stoichiometric ratio.

Rickley, Gaswärme, Vol. 7, No. 4, April, 1958, p. 147.

HOT SMOKING UNIT FOR MEAT TRADE

A NEW smoking unit for the meat industry has been developed to use the 'injector' burner principle. It consists of a water trough and sawdust tray combined into a unit with an overall length of 970 mm., including screwed pipe connections, a height of 350 mm., a width of 150 mm. in the operating position and 250 mm. when the sawdust tray is swung out to stop smoking.

The burner is mounted at the narrowest part of the cross section, level with the underside of the water trough and between this and the sawdust tray. The burner sucks in combustion air outside the smoking chamber and the flames are directed to produce a circulation of the smoke, so that the meat does not need to be moved around during smoking.

Hot Air Production

During the first part of the process the generator operates solely to produce hot air and when the meat begins to cook the sawdust tray can be swung into the smoking position. If the meat requires further cooking without smoking the sawdust tray can be again swung into the non-smoking position.

The burner itself is enclosed and cannot become soiled and it is claimed that this generator does not foul the smoking chamber itself.

Rickley, Gaswärme, Vol. 7, No. 4, April, 1958, p. 147.

GAS WILL 'MOTHER' 52,000 CHICKS A YEAR

AN annual load of 5,000 therms is expected to result from the installation at a Colchester, Essex, farm, of gas-heated chicken brooders which will assist in the production of 52,000 broilers a year. Some brooders are already in operation.

Colchester is in the Eastern Board's area and the District Manager is Mr. R. W. Hilham.

The birds are reared in closed houses each containing 1,000 day old chicks. The rearing period is between 10 and 12 weeks, when the birds are killed for the table at the weight of 3½ to 4½ lb.

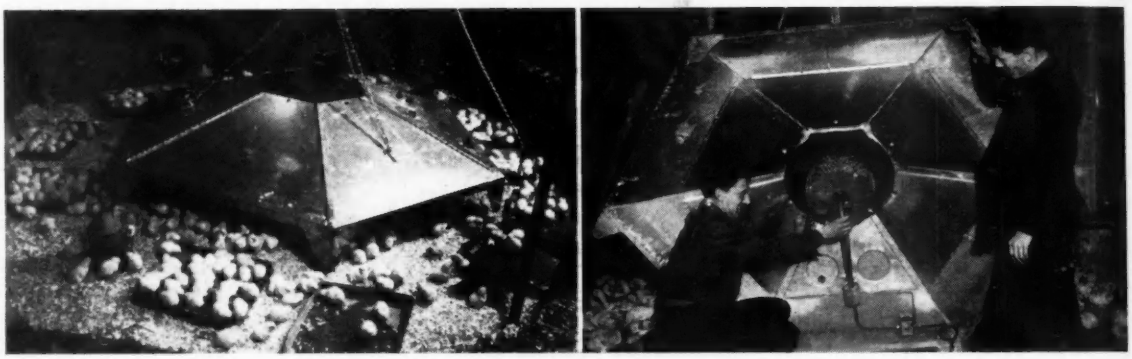
According to the time of year and weather, gas provides heat 24 hours a day for four to five weeks during each rearing period of 10 to 12 weeks.

The brooder unit was specially designed by Mayes of Wickford, thermostatically controlled to maintain a constant temperature of 60°F. in the house. The maximum gas rate per brooder is 35 cu.ft. per hour.

In providing a constant temperature gas has proved to be a superior fuel to electricity and oil. The owner of the farm says that the former fluctuates considerably, and when there is a voltage drop, particularly during the colder periods, the mortality rate is very high; with the latter, mortality is also high unless the oil-fired brooders are constantly supervised. There is also considerable fire risk.

The brooders are mounted on pulleys and connected to the supply by means of flexible tubing. In the early stages, the brooder is positioned at about a foot from the ground, and the day-old chicks snuggle underneath in a temperature of 90 to 100°F. As they grow, so the brooder is raised by block and pulley giving a wider distribution of heat.

By the end of September the total capacity of 13 houses will, it is expected, be heated by gas.



Two different angles of one of the brooders.

ONE DEGREE UNDER?—TRY THE ASPRO INDUSTRIAL CANTEEN TREATMENT

A TYPICAL industrial gas-catering application is at the factory of Aspro-Nicholas, Ltd., Slough, Bucks.

The kitchen, shown in our picture, was planned by Benham & Sons, Ltd., in collaboration with the architects, J. Douglass Mathews & Partners, and the Catering Manager at the factory.

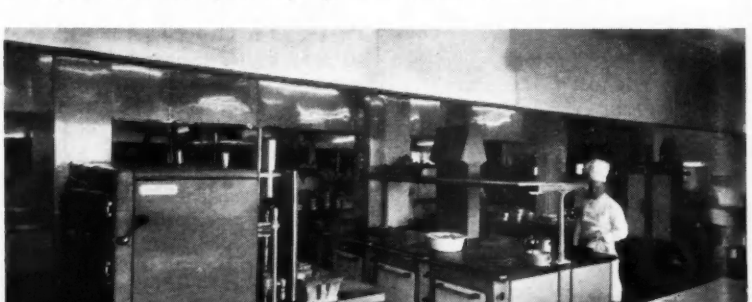
Compact, the kitchen incorporates the most up-to-date equipment and planning, and caters for canteen service for a total of 850 in two sittings (lunches, morning and afternoon breaks). A large, attractively designed and equipped canteen seats both the staff and the works personnel. The self-service counter, specially designed by the architects to blend with the general décor, is situated in the centre of the long wall, while at the end of the room a snack bar serves tea and coffee, sandwiches and snacks.

The kitchen equipment was supplied, installed and for the most part manufactured by Benham & Sons, Ltd., who also fitted the overhead anodised aluminium hoods.

The gas and steam heated apparatus consists of: A 6-unit solid-top range (1 open-flame) with full width bain marie; a double deck general purpose oven; a roasting oven; three deep fat fryer units; two salamander grills; one double and one single unit wet steam ovens, four 30-gal. boiling pans, steam heated; and one stockpot stove.

For pastry preparation there are a double deck pastry oven, a stainless steel bench and sink, and marble bench, and a boiling table.

Washing-up facilities include a Hercules dishwasher.



BISCUIT MANUFACTORY CONSUMES 150 Mill Cu. Ft. OF GAS A YEAR

Exterior of Huntley & Palmers' Reading factory.

PROMINENT among the increasing uses of gas in industry are its applications as an ideal form of fuel for the baking industries and particularly in the manufacture of biscuits. In this connection in recent years there has been a trend towards the conversion of existing solid fuel ovens to gas firing and the installation of completely new gas-fired equipment.

One of the first firms to recognise the value of gas-fired ovens for biscuit manufacture was Huntley & Palmers of Reading, whose world famous products are baked on a wide variety of gas-fired equipment, including some of the most up-to-date installations in the country. Today this firm uses 150 mill. cu. ft. of gas a year.

It is a far cry from the highly mechanised operations at Huntley & Palmers in 1958 to the day in 1826 when Thomas Huntley started his career as a 'Wholesale Biscuit Baker and Confectioner' in a small shop in London Road, Reading, where he kneaded his dough by hand and slowly baked it in ovens fired by coal.

After Huntley had established the business with a reputation for turning out a product of the highest quality, he was joined in 1841 by George Palmer, who brought his engineering abilities to the partnership and so enabled Huntley's outstanding biscuits to be produced in the quantity necessitated by the huge demand created by their excellence.

Today, Huntley & Palmers are justly proud of the world-wide reputation of their products while the factory itself, employing upwards of 3,500 workpeople and occupying more than 24 acres on a site bisected by the river Kennet, ranks as the world's largest factory devoted solely to the manufacture of biscuits.

Several factors combine to make gas a specially suitable form of fuel for the baking industries in general and the manufacture of biscuits in particular. There is for example, the nature of the gas flame itself, which can be regulated to any size required and can be readily adapted to the particular needs of the type of biscuit being produced.

Burners now available, range from the simplest patterns for straightforward baking to special equipment constructed to precision limits and subjected to the regulation and control of electronic and other devices.

Not only do these developments permit the latest baking techniques to be applied in the regulation of oven temperatures, but the greatest economy in fuel consumption can be observed since only the precise amount of fuel required for a particular baking job is used.

Both these aspects of the problem can be seen in operation at Huntley & Palmers where continual research into the production of high quality biscuits demands the highest degree of flexibility in the oven equipment employed. This is particularly the case with the travelling oven in which the temperatures can be zonally adjusted throughout its length in accordance with the requirements of the baking procedure.

A firm whose output is on the scale of Huntley & Palmers clearly reaps considerable benefits from the advanced degree of mechanisation which has been introduced into the biscuit manufacturing process and in

which the gas-fired oven plays a particularly important part. The application of automatic methods to the initial processes of mixing and handling of baking materials means that mechanisation becomes equally necessary at the baking stage in order to maintain a uniform production flow rate. Whatever the degree of mechanisation introduced into the mixing and packing operations, the oven remains the heart of the biscuit-making process.

Hygiene All-Important

Hygienic manufacturing conditions have been a cardinal feature of the Huntley & Palmers establishment throughout its 132 years' existence. This strict attention to cleanliness can be seen in the preliminary stages of manufacture where the materials are scarcely touched by hand. The travelling gas-fired oven permits the biscuits to remain out of contact with the human hand until the packing department where highly mechanised methods again are employed.

In short, hygienic conditions in the factory have been brought to a pitch of which the original Mr. Huntley, stickler for cleanliness though he was, could never have dreamed. Nor can he have visualised the importance of using a smokeless fuel in an age when pollution of the air with dark smoke has led to the present Clean Air Act.

Productivity is increased by the facility with which gas-fired ovens can be fitted with automatic regulation devices such as thermostatic control and automatic ignition which not only reduce the factor of human error present in older-type baking establishments but require fewer operators to be in duty throughout the baking process.

Various types of baking equipment manufactured by three of the country's leading firms in this field are in operation at Huntley & Palmers, namely, T. & T. Vicars, Ltd., of Earlestown, Lancs.; Baker Perkins Ltd., of Peterborough, and the Spooner Food Machinery Engineering Co., Ltd., of Ilkley, Yorkshire. The equipment includes both travelling ovens and draw-plate ovens together with such ancillary equipment as wafer stoves.

Flow Process

By linking travelling gas-fired ovens to mechanised dough preparation equipment, biscuits can be produced in accordance with the flow process techniques to which they are particularly suited. This is the main impression gained from a sight of the large Huntley & Palmers south factory where what are in effect seven production lines can be seen in continuous and simultaneous action.

The seven ovens, all just over 200 ft. in length, have been set up side by side in the well-lit factory building so that up to seven different types of Huntley & Palmers biscuits come off this section of the factory simultaneously.

Dough for use in these seven ovens is prepared in a separate department and brought to the south factory in trucks whence it is removed by hand in appropriate quantities and placed on the moving belt at the start of each production line.

When the dough has been reduced to the correct thickness, an automatic stamping device cuts biscuits of the required size from the moving belt of dough and at the same time imprints the design, including the well-known cipher 'H & P,' on each embryo biscuit which at this stage is naturally much smaller than its ultimate size.

Waste trimmings of dough left over following the action of the cutter, are fed to an overhead conveyor and returned for re-use to the first of the rollers at the commencement of the whole process.

Moving Belt

Biscuits enter each oven on a moving belt whose speed varies with the baking time of the biscuits concerned. This is also affected by such variable factors as the quality and type of flour used; in spite of the advanced degree of mechanisation, the acquired know-how of the skilled mixer and baker still has an important place in the baking process.

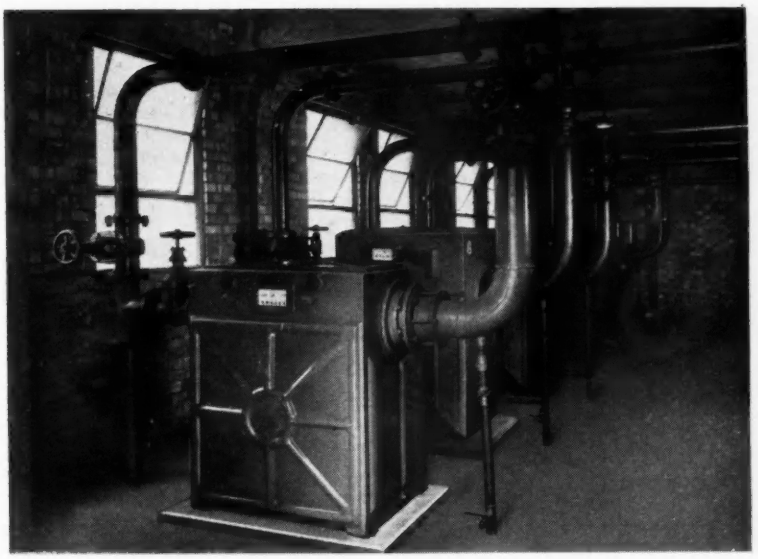
These baking speeds are set into the equipment before the start of a production 'run,' while at the same time the heat is zonally adjusted along the length of the oven. While no hard-and-fast rules can be laid

Biscuits by the million! Done to a turn, these Huntley & Palmers biscuits have just emerged from the gas-fired travelling oven and are proceeding on endless belts to the packing department situated on a higher floor in another building. The biscuits are cooled during this journey.

down in this respect, in general it is reckoned that a biscuit requires a higher temperature at the start of its progress through the oven than towards the end.

Although each oven can be used for every type of biscuit, if the oven speed and temperatures are suitably adjusted, in fact economic factors require that the equipment shall be used in fairly long 'runs.' In practice, it is not feasible to operate a production line of this type for less than half a day at a time and, in fact, in view of the steady demand for Huntley & Palmers established lines, average 'runs' are very much larger than this. The time required to change a particular oven and ancillary equipment from one biscuit to another varies widely, ranging from 20 minutes up to two hours.

There are seven travelling ovens in the south factory, of which three are by Vicars and the other four by the Spooner Food Machinery Engineering Co. Ltd. The latter have been supplied at various dates and represent the advances achieved by this Company in the design of their equipment in this field.



A view of the meter house at Huntley & Palmers' Reading factory, where the annual load is on an average level of 150 mill. cu. ft. of gas. There is ample light and ventilation and plenty of space for the taking of readings and the operation of controls.

Particular Interest

Particular interest attaches to the latest oven supplied to Huntley & Palmers by Spooners, namely, the Mark III biscuit oven, based, like the previous marks in this series, on the well-tried Spooner system of convection heating as developed over 30 years in many different industries and applied to biscuit manufacture since 1951.

In the development of the Mark III oven, the designers took account of two important factors, namely, that the quality of the product tends to improve as the actual baking temperature is lowered, and air velocity is a much more potent factor in heat transfer than air temperature. This latter point clearly underlines the importance of 'impingement baking.'

Fast Bake

For this reason, the Spooner Mark III oven is capable of a velocity of impingement of the highest practical level, so making possible a fast bake at low temperature. On the other hand, while the impingement velocity is high, it can be controlled within very wide limits in accordance with the requirements of the product being baked. This control is effected by dampers spaced every ten feet along the oven.

By means of these top- and bottom-heat dampers and the extraction dampers provided, the rate of heat transfer and the humidity can be closely controlled in each of the ten 20-ft. long sections, providing every possible combination of conditions for all types of biscuit.

For instance, the combination of dampers to vary the impingement velocity and adjustment of baking temperature at any stage of the baking process, results in precise control of the rate of heat transfer to the biscuit. Thus, biscuits with an even colour distribution or with attractive highlights are readily produced.

Humidity Control

Similarly, control of humidity level, in combination with control of heat transfer, enables the operator to accelerate or retard moisture removal at any stage of the process, thus providing a moist or dry bake at will, and so any type of surface finish that may be desired.

In operation, the oven offers many advantages due to the simplicity of construction. There is only one burner to each section, with thermostatic control and full protection. There are inspection windows between sections on the control side and cleaning doors at frequent intervals on the other side, giving access to the baking chamber.

An obvious advantage of a fast baking procedure is the increase in productivity which results. To illustrate this point Spooners claim that whereas 200 ft. of their Mark I oven was roughly equivalent to about 250 ft. of pre-1951 oven, 200 ft. of the Mark III oven is worth between 300 and 400 ft. of the earlier types.

While Huntley & Palmers are not in a position to give figures of gas consumption in their travelling ovens (which will vary widely with the type of biscuit and other factors) it can be assumed that their experience would not differ widely from that of the biscuit industry in general where it is found that ovens of this type will yield results which lie between 50 and 100 lb. of biscuits per therm of gas, depending on the product concerned.

Similar considerations apply to figures of gas consumption per hour which will vary with the type of oven and biscuit. Average gas consumption throughout the biscuit industry as a whole is estimated to range between about 10 and 20 therms per hour.

Cooling Belt

When the biscuits emerge from the ovens at the end of their appropriate baking times, they proceed on a cooling belt to the packing department. Because of space requirements, the cooling belt reverses the previous direction of flow and, moving in an inclined plane, carries the biscuits through an enclosed passageway across the intervening space between the bakery itself and the packing department on the higher floor of an adjacent building.

Highly mechanised packing machinery, an increasing proportion of it of British manufacture, wraps the now-cooled and thoroughly inspected biscuits into the familiar outer wrap which is recognised by shoppers in the United Kingdom and the many overseas markets to which a quarter

of Huntley & Palmers output is annually exported.

All the seven ovens in the south factory are of comparatively recent installation, the first 204 ft. travelling oven having been installed just prior to the second world war. For the most recent installations, however, it is necessary to turn to the north factory where a Vicars five-tier oven is now in its fifth year of successful operation. In the same building a Vicars five-tier, three-zone oven has just been installed.

Mechanical Mixing

Both these ovens will eventually work in conjunction with the advanced form of mechanical mixing equipment (also manufactured by Vicars) which is already supplying dough for the first of the two ovens in the north factory and which has been set up with the intention of eventually supplying dough for both ovens. The equipment is at present working solely on the popular Huntley & Palmer breakfast biscuit whose rusk-like composition makes special demands on the mixing process.

In this ingenious mixing equipment, batch-mixing methods are employed using containers which travel on a conveyor belt timed to follow a predetermined route at appropriate speeds for the processes required. The cycle begins with the insertion of the requisite amount of mixing liquid into the first container in the cycle which is then positioned beneath the automatic scales which weigh the appropriate amount of flour into the container.

This container then moves to a stirrer after which it passes through a time-wasting cycle involving a slow series of vertical movements. This is to enable 'proving' to take place, a process required by this type of biscuit, under which the dough is permitted to recover from moulding and allows fermentation to proceed.

Back on the conveyor belt again, the mixture (more usually known as sponge) receives its allocation of butter and a further allocation of flour, both automatically supplied. At this point a further mixing process occurs.

When ready for rolling out, the dough is ejected from the container by a tipping motion, the process of ejection being aided by the container's Teflon lining with its non-stick qualities. Provision is made for the containers to be emptied in such a manner that their contents can be rolled for use in connection with either of the two ovens which will eventually be served.

Twin Operation

Up to the present the equipment, which has been in operation for about 18 months, has been supplying dough to the single oven in operation. When the second oven comes into production it is intended that the two ovens shall be fed by alternate containers, which will follow one another on a 4½ minute cycle.

Rolling out processes of the normal kind follow until the dough-shapes are automatically fed on to a rectangular pan and covered with an automatically-operated lid on entering the oven. The pans arrive from below after following a cooling cycle while the lids, similarly cooled, are placed in position from above.

Installed in 1954, the Vicars five-tier travelling oven which is already in use has 154 multiple burner assemblies operating on a gas pressure at the manifold of 11.5 lb. p.s.i. With the regulation of the gas supply to the five tiers this can be reduced to 5 lb. p.s.i. Gas consumption is at the rate of rather less than 3,000 cu.ft. per hour.

Temperatures within the five tiers will vary considerably in operation, depending on various factors, and may be as low as 200°F. or as high as 400°F. A spot check taken while the oven was in use showed tier I at 405°F., tier II at 310°F., tier III at 210°F., tier IV at 340°F., and tier V at 400°F. Burners are set for the conditions required and thereafter remain at the manual setting desired by the baker.

This oven is employed on a round-the-clock basis, operating 13 11-hour shifts a week and producing biscuits at the average rate of 500 lb. per hour, giving an average weekly total, on the 13 shift basis, of some 32 tons of biscuits a week. For those who prefer their statistics in millions, this is understood to be the equivalent of about 3.44 mill. Huntley & Palmers breakfast biscuits a week!

Fool-proof

A notable feature of this oven is the fool-proof starting-up sequence. When all is in readiness for starting up, a warning is sounded. After the main drive motor is started, the clutch is let in and the main machine and oven chain begins to run. If the dampers have been opened, the exhaust fan motors can then be started. Purging of the oven follows and then the gas compressor motor is started up. The oven can then be fired.

Safety is also an important feature of the oven during operation. In the event of any failure, as, for example, the lid of one of the trays in the oven becoming dislodged, the gas compressor is cut off automatically if the fault is not located and remedied within the safety period of three minutes.

Instrumentation

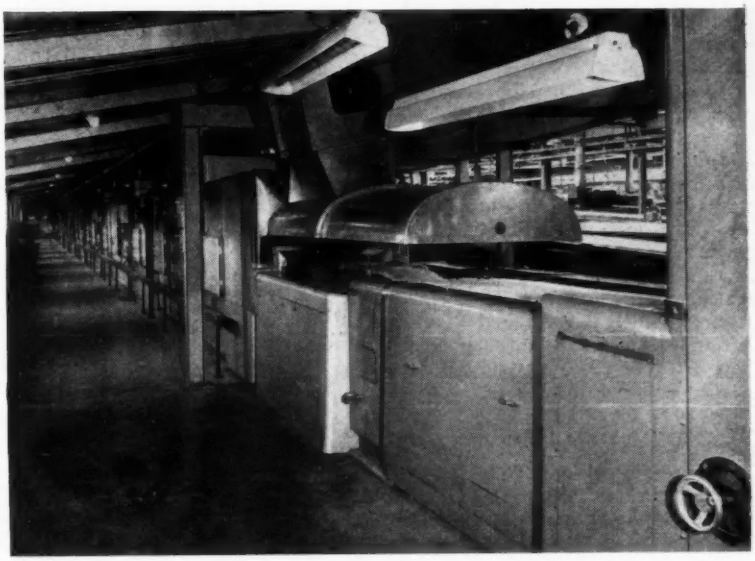
Three 2 h.p. electric motors provide power for the exhaust fans while the gas compressor is powered by an 8 h.p. electric motor.

An instrument panel is conveniently sited near the centre of the oven at a point where the personnel on duty can observe the entire process as it affects them, from the time when the next batch of dough is tipped out of the

These Baker Perkins drawplate ovens, which are gas-fired, are used in the baking of Huntley & Palmers cakes.

container preparatory to rolling out. The control panel contains the necessary indicators and dials relating to the oven, including temperature indicators for the zones in each of the five tiers.

In another bay adjacent to this equipment, the new Vicars five-tier, three-zone oven has been installed and has undergone the customary exhaustive tests before commissioning. The first of its kind to be installed by Vicars, this equipment has an overall length of about 300 ft., including an oven length of about 60 ft.



An impression of space and ease of operation is given by this view of one of Huntley and Palmers' travelling ovens. These ovens are 204 ft. long and are sited side by side in this well-lit hygienic south factory building. When this picture was taken, seven different types of Huntley & Palmers biscuits were coming off the production lines.

No Interruption

Those who are concerned with the space problems associated with the installation of these modern travelling ovens will be interested to note that this particular piece of equipment has been installed at Huntley & Palmers in a portion of the existing factory buildings converted from other purposes and without any interruption to production.

Its 15 burners (five to each zone) will operate on gas at town pressure (say, about 6 in. w.g.) with a maximum consumption of about 9,000 cu.ft. per hour and an average figure in production more in the region of 3,000 cu.ft. per hour. It is clearly not possible at this early stage to give any precise information as to the likely performance of this outstanding new piece of biscuit making equipment. When in production it will be employed on the Huntley & Palmer breakfast biscuit.

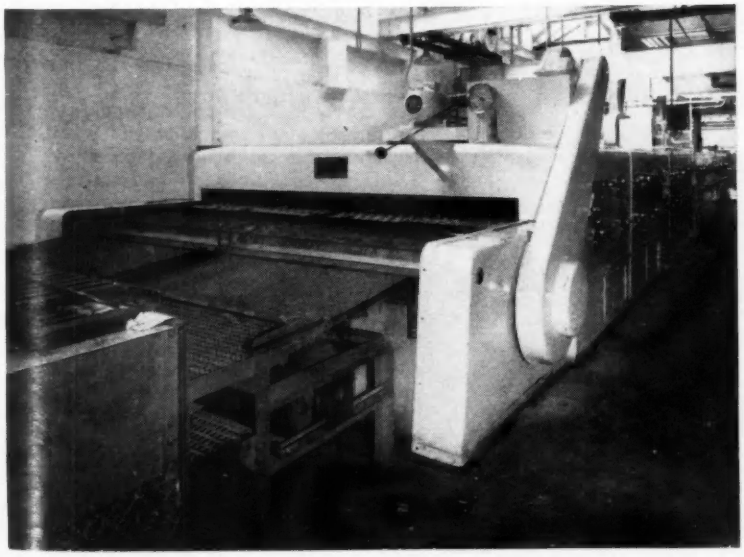
Safety arrangements are incorporated at all stages of operation, commencing with the start-up procedure incorporating an audible signal to warn all operators in the vicinity. The dampers are then opened, the exhaust fans started and the re-circulation fans switched on.

Power is provided by a 12.5 h.p. variable speed motor, plus 15 units of 7½ h.p. each driving the re-circulating fans. Flame failure and automatic ignition devices are incorporated and there is a safety cut-out arrangement in the event of failure of, for example, any one of the baking pans.

An effective instrument panel is conveniently sited. This is divided into three sections, one for each zone, and each section contains the necessary temperature and other controls for the five tiers in that section.

It is perhaps not generally realised that Huntley & Palmers produce cakes as well as biscuits yet, the firm annually sells many thousands of cakes of all types, including the wedding cakes for which the Company is particularly noted.

Gas-fired drawplate ovens are used for this purpose, including a bank of double-deck drawplates supplied by Baker Perkins Ltd. Other gas-fired ovens in use include four large and five small wafer ovens, also manufactured by Baker Perkins.



A feature of the gas-fired travelling oven is the way in which heating conditions can be zonally adjusted to meet the requirements of the product being baked. The zones, with their appropriate burner assemblies and ancillary equipment can be clearly seen.

Canteen

Gas is also used in the firm's large and well appointed canteen and a gas drier is used elsewhere in the factory for drying tins.

In a factory where gas is employed for oven-firing on the scale of Huntley & Palmers, it is evident that the firm must depend to a considerable extent on the supply of gas it receives from the Gas Board. An adequate supply is ensured through connection to a 24-in. main, from which the factory takes its gas through a number of mains ranging from 6 in. to 10 in.

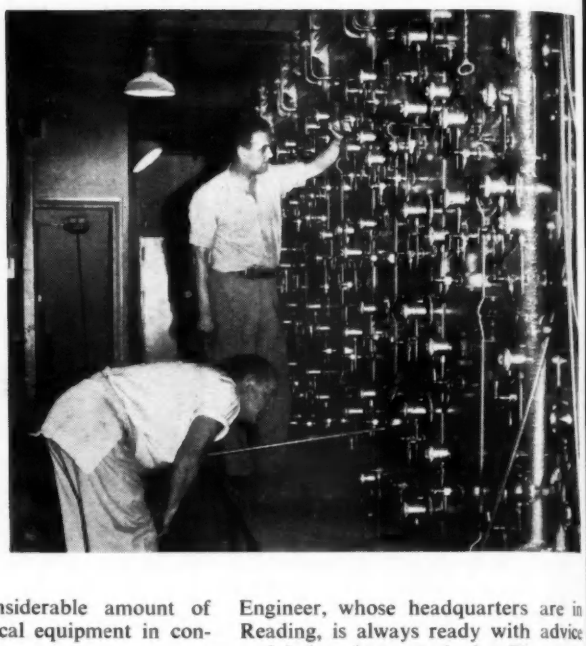
Altogether a dozen meters are in use, ranging from 1,200 to 20,000 cu.ft. per hour capacity.

While neither the Company nor the Southern Gas Board can say with any certainty whether the siting of the Reading gasworks had any connection with the position of the factory, the fact remains that today only a narrow road separates the factory from the gasworks. This close physical proximity is matched by the equally close co-operation which exists between the factory and the Gas Board, as would be expected from the fact that Huntley & Palmers are the largest consumers of gas in the district.

Maintenance Department

Huntley & Palmers has its own highly efficient maintenance department and well equipped workshops with the result that a considerable amount of the installation and modification of equipment is carried out internally. Maintenance and servicing of the ovens is on a high standard, regular schedules being adhered to for proper care and maintenance of all equipment.

This involves a wide variety of work since it must be remembered that in addition to the gas ovens themselves there is a considerable amount of ancillary electrical equipment in constant use.



Two operatives in the Huntley & Palmers Reading factory give skilled attention to a tier oven.

Although the factory is thus able to shoulder much more of the service load than would normally be the case in a smaller or less efficient concern, the Southern Gas Board's Industrial Engineer, whose headquarters are in Reading, is always ready with advice and help when required. The two-way exchange of views between those concerned with the utilisation of gas in the factory and those responsible for its production cannot but be of lasting advantage to both sides.

INDUSTRIAL CONDITIONS IN U.S.A.

Mr. J. D. Harper, son of the Managing Director of John Harper & Co., Ltd. reports on a winter spent in North America when he devoted considerable study to foundry metallurgy

RAW materials for the U.S. foundry industry are much the same as those in Britain. Generally speaking the phosphorus content of their iron ore is lower than ours so that even cheap gray irons often have phosphorus contents as low as the materials used in Europe to make high quality iron—like Meehanite.

This generally benefits the mechanical properties, but it also means that the molten iron is less fluid and so must be poured at a higher temperature. As a consequence of this, together with the types of moulding sand used, the surface finish on American castings is not good unless special and expensive techniques are used.

The greatest difference in the raw material situation is that of fuel supplies; particularly oil and natural gas which is piped, often for thousands of miles to almost every city in the country.

Many of the foundry workers are Negroes who come north and into the industrial regions away from the South where jobs are scarce and racial segregation irksome. These people are very cheerful and seem to be content to work hard at uninteresting repetition tasks.

Skilled moulders, on the other hand, are rather rare—quite often they are immigrants from European foundries—and tend to become concentrated on to supervision and inspection jobs. A common feature of American foundries is a very high ratio of technicians and foremen to workers.

There are many more university graduates than here, although the standards at some of the smaller universities are much lower than those in Europe or the better known colleges over there, like Harvard, M.I.T. and Cal. Tech.

The whole situation—very expensive rather unskilled labour, and relatively high numbers of technicians—has grown up together with, both as a result and a cause of, a high degree of mechanisation. In the forty odd foundries I saw the extent of mechanisation varied from the highly automated mass production lines to the unmechanised hand moulding sections of some jobbing foundries.

Of course, the jobbing foundries, where a great variety of work is dealt with, cannot mechanise as much as those making enormous numbers of

castings of a few types. Factories such as the motor car foundries are like a page from a science fiction novel, with every least operation automated to the maximum.

The castings have been designed just as much for economy and ease of production as for their use in the finished car. So rapid is the process that sometimes the cylinder blocks are still warm from the foundry in the finished engine.

Sometimes mechanisation seems to have gone too far. It is said that the production procedures forbid the development of a type of car different in anything but detail from the present lines.

I saw one machine, for closing together the two halves of a mould, an operation previously done by one unskilled man and a hoist. Now there is a full time, highly skilled electronics engineer keeping the machine in working order.

But these cases are exceptional and the continual drive is to find ways to do things more and more quickly and efficiently. Every new development tends to be looked at from this point of view—shell moulding, for example, is judged by the potentialities it gives for mass production rather than for any benefits of quality which it may or may not confer.

This type of attitude tends to extend to the research side as well. Metallurgical (and other) research is done in universities or research institutes on schemes sponsored by industry, which is concerned with production. Only the minority have the foresight or the money to sponsor fundamental types of research.

Sputniks

While I was there the sputniks went up and aroused a popular demand for more research—always for more research, or bigger laboratories rather than a different type of research.

Many scientists I met were aware of this situation, and universities are now increasing their fundamental research facilities. In the meantime the efforts put into development and applied research yield remarkable results.

The questions which most people ask me now I am back are about the current recession. This, of course, is still going on and the situation has changed even since I was there, and no one agrees on its seriousness.

I asked most of the people I visited about it and their answers are best covered by the definition ex-President Truman gave the other day: 'It is a recession when your neighbour loses his job, a depression when you lose yours.'

Some of the foundries were down to three days a week with many people laid off—these were the most pessimistic. Others who were still on full, or over-time (because of their particular market or because of special technical skills) were inclined to minimise the seriousness of the situation.

Every month the Grey Iron Founders' Institute in Cleveland publishes some statistics, and these include a figure called the Maximum Commercial Demand—that is the largest sales ever made in that area in a month. The sales volume for December, 1957, varied according to area from 47%-69% of this M.C.D., averaging 57%, showing that the industry was quite hard hit.

Hard though the situation then was for the companies it was even worse for the men who were laid off or on short time. The major part of each pay packet goes on time or h.p. payments, and any stopping of the source of supply can mean the loss of anything from television sets, kitchen ranges, dwelling houses, or worst of all, cars.

Hardship

If unemployment continues life becomes very hard since employment compensation is small and limited in time—afterwards they have to subsist on charity as best they can.

The whole situation seemed to be tied to the car industry, and this was then in a poor state with thousands unemployed in Detroit. Orders seemed unlikely to increase as there were signs of a revulsion from the huge flashy type of car, and in any case a man who has lost his job cannot pay for a new car.

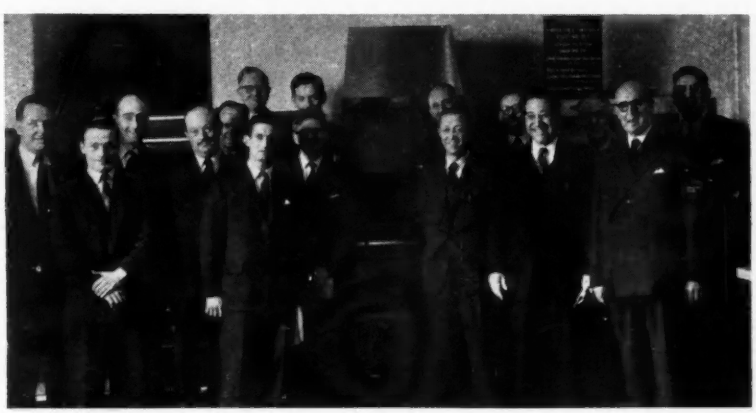
I saw one assembly line, at Fords, making one car every 45 seconds, 24 hours a day. Somebody, somewhere, has to step forward and buy a car, one every 45 seconds 24 hours a day. And this was only one line, of one company. To me, and I am no economist, it seems that a snowball reaction, spreading far beyond Detroit, and far beyond America, could easily happen—if it is not already happening.

Hardware Show

Manufacturers were being driven to more and more sales effort. Some of this effort was directed towards high pressure methods—I went to the Annual Hardware Show in New York and all the stands were equipped with gaudy lights, free cigars, blondes in spangled bathing suits, and the full paraphernalia of the American salesman.

Castings hardly lent themselves to this technique and so jobbing foundries were relying on a more technical sales effort, trying to develop products outside the highly competitive grey iron castings field.

The development of nodular (spheroidal graphite or ductile) iron, for example, was going ahead very fast, and I saw it used for crankshafts, pipe fittings and clamps, agricultural and excavating machinery, gears, valves, hubs and many other applications exploiting the high strength, shock resistance, ductility, or rigidity that can be achieved in this material.



This party from the Gas Council's potential commercial catering representatives' third training course at Watson House are visiting Benham & Sons, Ltd., the well-known kitchen engineers, accompanied by Mr. B. Taylor and Mr. H. G. Poore of the training section, North Thames Gas Board. They were shown how a complete kitchen is handled through the planning drawing office, and two of the Company's factories in South London were visited. This picture was taken while the party was inspecting the new gas underfired grill.

Domestic Warm-air Units that Can Be Used in Larger Premises

Paragon (Leeds) Sheet Metal Co., Ltd., who were awarded a very large contract some years ago for the supply and installation of oil-fired forced warm-air heating installations into the houses of U.S. airmen in this country, have now produced a range of gas-fired, forced warm-air furnaces of equal merit, selling at very competitive prices. These units are also being put into school extensions and similar buildings.

The units are in elegantly-finished stove enamelled steel cabinets, require the minimum of cleaning, and have been developed under the Development Committee of the Gas Council.

Fully Automatic

The furnaces are fully-automatic in operation. A pilot flame, which is thermo-couple protected, ignites the burner at the dictation of the room thermostat as temperatures fall below its setting. The double inlet, multi-vane, centrifugal fan does not however come immediately into action as the only result of this would be to blow cold air out into the rooms.

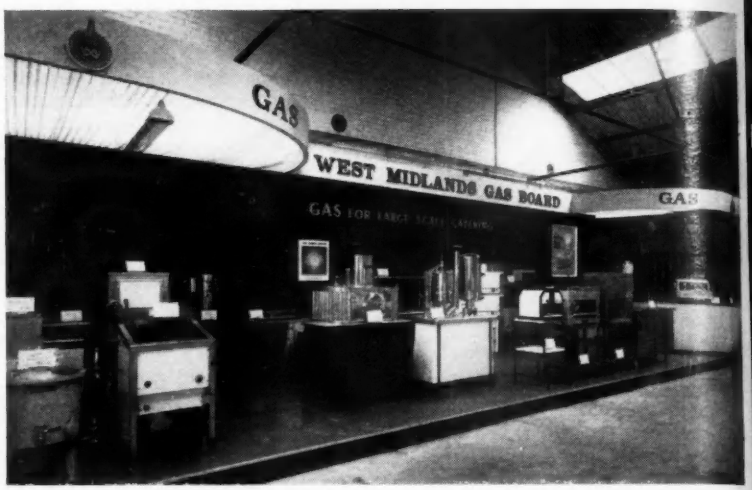
The fan action is determined by a combination control arranged to start the fan as soon as air in the cabinet is sufficiently warm. Then the air is blown quietly out through ductwork to the rooms, eventually finding its way back to the unit for rewarming and filtering.

As the temperature of the rooms rises past the thermostat setting, the thermostat turns off the burner leaving the pilot jet only. The fan, however, continues to run until the unit has become sufficiently cool to allow automatic switching off. The combination control permits air circulation to be arranged in summer without the burner being ignited, and it also includes a high limit control which prevents any possible chance of the unit becoming overheated.

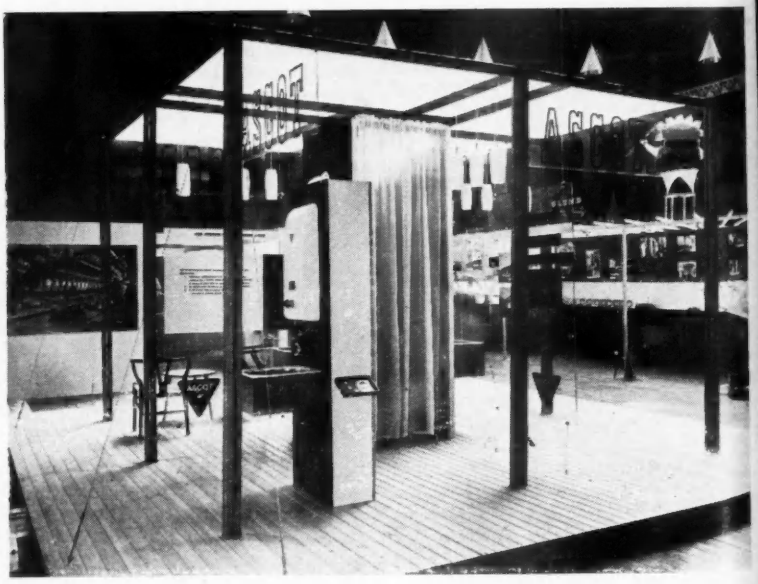
Quiet Operation

One of the big advantages which these units can boast of in any comparison with the increasingly popular oil-fired installations, is their quietness of operation.

Running costs depend very largely on the way the thermostat is used by the owner but, in the modern house now selling at £3,000 to £4,000, they might be expected to be around £75 a year with fairly good insulation and provided reasonable demands are made.



The first Midlands Hoteliers', Caterers' and Catering Equipment Exhibition was held in the Princes Hall, Bingley Hall, Birmingham, recently. The promoter has decided to stage it again next year. The West Midlands Gas Board occupied a prominent position, staging a comprehensive representation of large scale catering equipment, most of which was connected for demonstration, including the new Conte Expresso unit. Apart from orders placed on the stand, there were many enquiries and requests for advice on kitchen planning and individual installations.



Ascot Gas Water Heaters, Ltd., exhibited in the first Gas in Industry exhibition held in Odense, Denmark, recently. The stand was designed by D. E. Pugh, A.R.I.B.A., and was prefabricated in London by Apex Studios, Ltd. Appliances on show included the 509 boiling water heater, 503 sink heater, 715 B/F multipoint heater and 726 central heating unit, which is specially designed for overseas markets. The exhibition coincided with the annual meeting of the Danish Gas Engineers. Sir Harold Smith, Chairman of the Gas Council, was present. Invitations to the exhibition went to gas engineers and officials throughout Scandinavia and to Scandinavian architects and builders.